

# Index to 1984 NASA Tech Briefs

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FEBRUARY 1987

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N92-70025

Unclas

29/85 0048098



Electronic Components and Circuits



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# INTRODUCTION

Tech Briefs are short announcements of new technology derived from the research and development activities of the National Aeronautics and Space Administration. These briefs emphasize information considered likely to be transferrable across industrial, regional, or disciplinary lines and are issued to encourage commercial application.

This *Index to NASA Tech Briefs* contains abstracts and four indexes — subject, personal author, originating Center, and Tech Brief Number — for 1984 Tech Briefs.

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## Originating Center Prefixes

ARC	Ames Research Center
GSC	Goddard Space Flight Center
HQN	NASA Headquarters
KSC	Kennedy Space Center
LAR	Langley Research Center
LEW	Lewis Research Center
MFS	Marshall Space Flight Center
MSC	Johnson Space Center (formerly Manned Spacecraft Center)
NPO	Jet Propulsion Laboratory/NASA Pasadena Office

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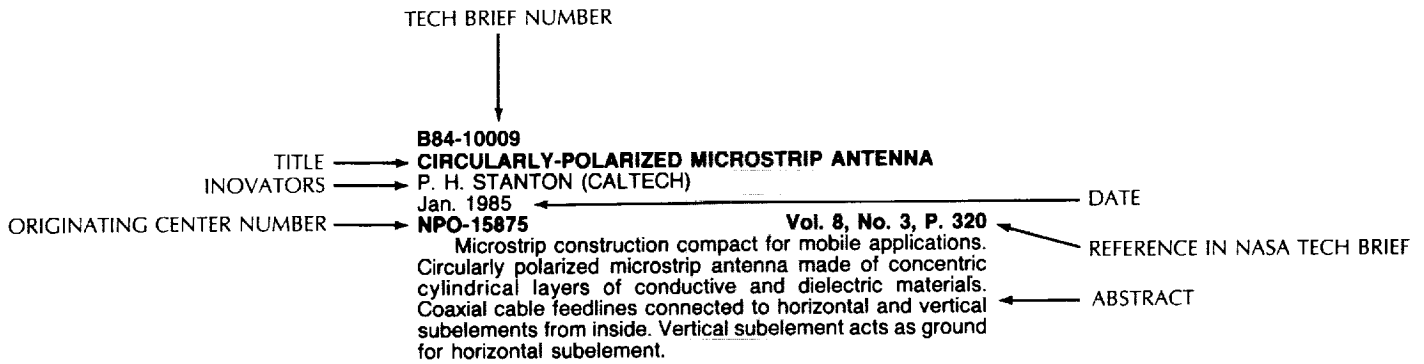
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# TYPICAL ABSTRACT ENTRY









# Index to 1984 NASA Tech Briefs

## FEBRUARY 1987

### Abstract Section

## 01 ELECTRONIC COMPONENTS AND CIRCUITS

**B84-10001**

#### **BATTERY-OPERATED HIGH-VOLTAGE POWER SUPPLY**

A. P. RUITBERG and M. KENNETH

Jan. 1985

**GSC-12818**

**Vol. 8, No. 3, P. 313**

Circuitry allows large multiplication of voltage. Filament voltage is -80kV. Potential difference between terminals P3 and P4 adjusted to make grid 80 to 150 volts more negative than filament enabling grid to focus electrons from filament into stream impinging on anode, which then emits x-rays. Circuitry provides independently adjustable voltages in kilovolt range for x-ray tubes and other instruments.

**B84-10002**

#### **X-BAND STRIP-LINE POWER DIVIDER/COMBINER**

B. L. CONROY (CALTECH)

Jan. 1985

**NPO-16086**

**Vol. 8, No. 3, P. 314**

Strip-line circuit for X-band signals both divides and combines microwave power for distributed amplifier. Strip-line pattern (foil pattern over insulating layer over ground plane) laid out so all eight distributed ports lie at electrical distances of odd integral multiples of half wavelength from main input/output port. Strip line used as power divider and as power combiner.

**B84-10003**

#### **OPTICAL LOGIC GATES**

E. R. DU FRESNE (CALTECH) and W. L. DOWLER (CALTECH)

Jan. 1985

**NPO-15134**

**Vol. 8, No. 3, P. 314**

Logic gates for light signals constructed from combinations of prisms, polarizing plates, and quarterwave plates. Optical logic gate performs elementary logic operation on light signals received along two optical fibers. Whether gate performs OR function or exclusive-OR function depends on orientation of analyzer. Nonbinary truth tables also obtained by rotating polarizer or analyzer to other positions or inserting other quarter-wave plates.

**B84-10004**

#### **TUNING CONCEPT FOR RESONANT CAVITIES**

R. L. SYDNOR (CALTECH)

Jan. 1985

**NPO-15890**

**Vol. 8, No. 3, P. 315**

Deviations from resonance detected by sampling phases. Automatic tuner feedback control system derives error signal from E and H plane probe signals. Control objective

to maintain phase difference between E and H at 90 degrees. Technique estimated to sensitive to fractional frequency deviation of about  $5 \times 10^{-16}$  and applicable not only to masers but also other microwave elements, including klystrons, general purpose oscillators, and frequency standards.

**B84-10005**

#### **ISOLATION MOUNTING FOR CHARGE-COUPLED DEVICES**

W. C. GOSS (CALTECH) and P. M. SALOMON (CALTECH)

Jan. 1985

**NPO-15551**

**Vol. 8, No. 3, P. 316**

CCD's suspended by wires under tension. Remote thermoelectric cooling of charge coupled device allows vibration isolating mounting of CCD assembly alone, without having to suspend entire mass and bulk of thermoelectric module. Mounting hardware simple and light. Developed for charge-coupled devices (CCD's) in infrared telescope support adaptable to sensors in variety of environments, e.g., sensors in nuclear reactors, engine exhausts and plasma chambers.

**B84-10006**

#### **SEMICONDUCTOR LASER PHASED ARRAY**

J. KATZ (CALTECH)

Jan. 1985

**NPO-15963**

**Vol. 8, No. 3, P. 317**

Oscillations synchronized and modulated individually for beam steering. Phased array of GaAs infrared lasers put out powerful electronically-steerable coherent beam. Fabricated as integrated circuit on GaAs chip, new device particularly suited to optical communications, optical data processing and optical detection and ranging systems.

**B84-10007**

#### **DIRECT-CURRENT UNBALANCE DETECTOR**

A. P. WAGNER (CALTECH)

Jan. 1985

**NPO-15978**

**Vol. 8, No. 3, P. 318**

Short circuits to ground indicated by voltage changes. Current transducer connected in bridge circuit with floating 30-Vdc power supply measures voltage unbalance between positive and negative powerlines and ground. Detection circuit output swings higher or lower than normal balanced condition voltage to signify unbalance toward positive or negative side respectively. Circuit configuration adaptable to monitor 4- to 20-mA current loops often found in industrial controls.

**B84-10008**

#### **CIRCUIT FOR MONITORING CELL VOLTAGES**

J. W. LEPISTO (TRW, Inc.)

Jan. 1985

**MFS-25924**

**Vol. 8, No. 3, P. 319**

Circuit monitors voltage of each cell in electrical battery

## 01 ELECTRONIC COMPONENTS AND CIRCUITS

within few millivolts. Circuit includes two bipolar analog multiplexers: repeatedly sample outputs of 12 1.5 volt cells. Terminals of multiplexer 1 connected to positive sides of cells and terminals of multiplexer 2 connected to negative sides. Outputs of multiplexers connected to differential operational amplifier: provides signals for recording and display.

**B84-10009**

### **CIRCULARLY-POLARIZED MICROSTRIP ANTENNA**

P. H. STANTON (CALTECH)

Jan. 1985

**NPO-15875**

**Vol. 8, No. 3, P. 320**

Microstrip construction compact for mobile applications. Circularly polarized microstrip antenna made of concentric cylindrical layers of conductive and dielectric materials. Coaxial cable feedlines connected to horizontal and vertical subelements from inside. Vertical subelement acts as ground for horizontal subelement.

**B84-10010**

### **POWERLINE COUPLER FOR WINDMILL MOTOR/GENERATORS**

F. NOLA

Jan. 1985

**MFS-25944**

**Vol. 8, No. 3, P. 321**

Efficiency at low windspeed increased by firing-angle control. Power coupled from wind-driven induction motor/generator to ac powerline with help from circuit. Circuit reduces power consumed by field windings thereby improving efficiency at low windspeeds. Circuit includes zerocrossing detector, ramp generator and comparator similar to those used to set firing angles for thyristors in power factor motor controllers.

**B84-10011**

### **IMPROVED RF ISOLATION AMPLIFIER**

G. L. STEVENS (CALTECH) and J. MACCONNELL (CALTECH)

Jan. 1985

**NPO-16026**

**Vol. 8, No. 3, P. 322**

Circuit has high reverse isolation and wide bandwidth. Wideband isolation amplifier has low intermodulation distortion and high reverse isolation. Circuit does not require selected or matched components or directional coupling device. Circuit used in applications requiring high reverse isolation such as receiver intermediate-frequency (IF) strips and frequency distribution systems. Also applicable in RF and video signaling.

**B84-10012**

### **DIGITAL SEQUENCE CONTROLLER**

J. O. LONBORG (CALTECH)

Jan. 1985

**NPO-15725**

**Vol. 8, No. 3, P. 323**

Length and timing of pulse sequences user controlled. Digital circuit generates several pulse streams to control loads that must be synchronized allowing duration and phasing of each stream to be varied independently. Application of circuit to control pump for biomedical applications.

**B84-10013**

### **SOFTWARE FOR PROM PROGRAMING**

C. W. GOOLSBY (Rockwell International Corp.)

Jan. 1985

**MSC-20641**

**Vol. 8, No. 3, P. 323**

Driver program allows for programing, reading, and verification of various PROM's. Manual entry of data to DATA/I/O PROM Programmer timeconsuming and error-prone. Driver program combines file management capability of EXORCISOR with flexibility of DATA I/O system. Provides user with way of reading, programing and verifying PROM's storing data on disk, modifying files and printing data.

**B84-10014**

### **COMPUTERIZED INTERACTIVE HARNESS ENGINEER-**

**ING**

J. W. BILLITTI (CALTECH)

Jan. 1985

**NPO-16272**

**Vol. 8, No. 3, P. 324**

Computerized interactive harness engineering program inexpensive, interactive system for learning and using engineering approach to interconnection systems. Basically data-base system that stores information as files of individual connectors and handles wiring information in circuit groups stored as records.

**B84-10015**

### **ANTENNA RADIATION-PATTERN PROGRAM**

R. D. HUGHES (CALTECH), C. N. GUIAR (CALTECH), and C. L. LAWSON (CALTECH)

Jan. 1985

**NPO-16217**

**Vol. 8, No. 3, P. 324**

Effects of reflector deformations and feed characteristics computed. JPL Antenna Radiation Pattern computer program ANRAD, evaluates performance of radio-frequency antenna with paraboloidal main reflector by solving scalar far-field radiation pattern integral.

**B84-10016**

### **TEMPERATURE-STABILIZED PHASE DETECTOR**

L. YEEMAN

Jan. 1985

**NPO-15766**

**Vol. 8, No. 3, P. 324**

Precise temperature stabilized phase detector for clock signal distribution maintains 100-MHz signal with stability of 5 parts in 10 to the 16th power even for step changes of 20 degrees C in ambient temperature. Stabilization achieved by heating unit to 45 degrees C and maintaining temperature through bridge circuit.

**B84-10017**

### **NEGATIVELY COUPLED INDUCTORS FOR ODD-PHASE CHOPPERS**

R. L. JAMIESON (CALTECH)

Jan. 1985

**NPO-15380**

**Vol. 8, No. 3, P. 325**

Splitting windings of output inductors of negatively-coupled 'boost' chopper extends applicability to odd number of phases including three phases. New version concatenates output inductors of each phase with those of neighboring phases achieving negative coupling effect that suppresses unwanted harmonics.

**B84-10018**

### **MATHEMATICAL STORAGE-BATTERY MODELS**

C. P. CHAPMAN (CALTECH) and M. ASTON (CALTECH)

Jan. 1985

**NPO-15615**

**Vol. 8, No. 3, P. 325**

Empirical formula represents performance of electrical storage batteries. Formula covers many battery types and includes numerous coefficients adjusted to fit peculiarities of each type. Battery and load parameters taken into account include power density in battery, discharge time, and electrolyte temperature. Applications include electric-vehicle 'fuel' gages and powerline load leveling.

**B84-10019**

### **IMPROVED SPARK-IGNITOR CIRCUITRY**

D. G. OLSCHANSKY (Rockwell International Corp.)

Jan. 1985

**MFS-19751**

**Vol. 8, No. 3, P. 325**

Transformer reduces flyback voltage 350 V. Several modifications made to inductive discharge spark-ignitor system for rocket engine, which substantially reduce complexity of circuits and eliminate difficulties associated with component matching.

**B84-10020**

### **STOWABLE SOLAR-CELL ARRAY**

P. M. STELLA (CALTECH)

Jan. 1985

**NPO-15893****Vol. 8, No. 3, P. 325**

Solar electric power source easily storable and transportable. Source employs blanket of photovoltaic cells rolled up when not in use. The hollow core of canister reel used as storage space for radio equipment or first aid supplies, etc.

**B84-10021****BURNWIRE SIMULATOR**

G. L. BUMMER (CALTECH)

Jan. 1985

**NPO-15883****Vol. 8, No. 3, P. 325**

Fuse-containing device simulates pyrotechnic firing circuitry. Simulator includes housing receptacle connector at one end, and fuse at opposite end. Fuse circuit useful in any system having complex built-in wiring for current pulse applications.

**B84-10022****A SENSITIVE INFRARED PHOTODETECTOR**

S. K. SRIVASTAVA (CALTECH) and L. MALEKI (CALTECH)

Jan. 1985

**NPO-15926****Vol. 8, No. 3, P. 325**

Technique utilizing photodetachment of negative ions incorporated into sensitive photodetector which allows detection of low-energy infrared photons, without resorting to cryogenic cooling.

**B84-10023****PRECISE CONTROL OF A TUNABLE IR DIODE LASER**

R. T. MENZIES (CALTECH) and C. W. RUTLEDGE (CALTECH)

Jan. 1985

**NPO-16000****Vol. 8, No. 3, P. 326**

Tuning system applicable to lead-salt semiconductor tunable diode laser (TDL) and other solid-state lasers with temperature and current dependent emission wavelength developed for balloon borne, high-resolution spectrometer that measures trace atmospheric constituents in stratosphere. Instrument measures absorption at approximately 20 points in 100 MHz wide spectral line.

**B84-10024****TUBE-WALL THICKNESS DETECTOR**

R. E. KLEINT (Rockwell International Corp.) and R. D. BAILY (Rockwell International Corp.)

Jan. 1985

**MFS-19741****Vol. 8, No. 3, P. 326**

Eddy-current measurements detect wear of thin walls (0.01 in) (0.25 mm) in small diameter (0.19 in) (5 mm) heat exchanger tubing. Flexible durable thin rod inserts eddy-current coil into the heat exchanger tube.

**B84-10025****TWIST-FREE WIRE STRANDING**

R. W. HINES (Honeywell, Inc.)

Jan. 1985

**MFS-25914****Vol. 8, No. 3, P. 326**

Device for wire-stranding operations provides uniform tension and twist-free conditions for 30 gage or smaller high strand density flexible cable assemblies.

**B84-10225****HIGH-FREQUENCY, HIGH-POWER CAPACITOR**

C. W. WHITE (Maxwell Laboratories, Inc.) and P. S. HOFFMAN (Maxwell Laboratories, Inc.)

Apr. 1985 See Also NASA CR-168035(N83-27127/NSP)

**LEW-14034****Vol. 8, No. 4, P. 445**

Capacitor increases efficiency of high-frequency circuits. High-power-capacitor design uses split foil and floating foil plus multiple coils to reduce voltage drop across film and increases lifetime (10 years). Capacitor reliably operates at high frequency in environments normally not hospitable to electronic components.

**B84-10226****STABLE OPTOCOUPLER**

D. J. GRIFFIN (Perkin-Elmer Corporation)

Apr. 1985

**MFS-25927****Vol. 8, No. 4, P. 446**

Circuit stabilizes current-transfer ratio (CTR) of optically coupled isolator used as linear transducer. New circuit employs feedback circuit containing second optocoupler. Circuit is inexpensive, requires little additional hardware.

**B84-10227****REVERSING OPTICAL DAMAGE IN LINBO3 SWITCHES**

C. M. GEE (Hughes Aircraft Co.) and G. D. THURMOND (Hughes Aircraft Co.)

Apr. 1985

**NPO-16239****Vol. 8, No. 4, P. 447**

One symptom of optical damage in Ti-diffused LiNbO3 directional-coupler switch reversed by temporarily raising input illumination to higher-than-normal power level. Healing phenomenon used to restore normal operation, increase operating-power rating, and stabilize operating characteristics at lower powers. Higher operating power is tolerated after treatment.

**B84-10228****REAL-TIME REED-SOLOMON DECODER**

C. R. LAHMEYER (CALTECH)

Apr. 1985

**NPO-15982****Vol. 8, No. 4, P. 448**

RS decoder uses dedicated hardware and data pipelining for high-speed operation. Parallel processing techniques provide equivalent of over one billion operations per second at one step in decoding. Decoder finds commercial application in data encoding/decoding, telemetry, and radio communications.

**B84-10229****ADVANCED DC-TRACTION-MOTOR CONTROL SYSTEM**

O. VITTONI (Centro Ricerche Fiat S.p.A.)

Apr. 1985

**NPO-16118****Vol. 8, No. 4, P. 449**

Motor-control concept for battery-powered vehicles includes state-of-the-art power-transistor switching and separate excitation of motor windings in traction and regenerative braking. Switching transistors and other components of power-conditioning subsystem operate under control of computer that coordinates traction, braking, and protective functions.

**B84-10230****INTEGRATED LASER AND LIGHT DETECTOR**

J. KATZ (CALTECH), J. R. LESH (CALTECH), and R. M. DICKINSON (CALTECH)

Apr. 1985

**NPO-15943****Vol. 8, No. 4, P. 450**

Proposed infrared optical transmitter tracks distant beacon and automatically point transmitted beam toward beacon. Essential transmitter is integrated gallium arsenide device containing electronically-steerable semiconductor injection laser and position detector that senses direction to beacon. With satisfactory optics and sufficient power, system used for long-distance transmission.

**B84-10231****DIFFERENTIAL-COIL EDDY-CURRENT MATERIAL SORTER**

J. NUMMELIN (Rockwell International Corp.) and D. BUCKLEY (Rockwell International Corp.)

Apr. 1985

**MFS-19872****Vol. 8, No. 4, P. 451**

Small metal or other electrically conductive parts of same shape but different composition quickly sorted with differential-coil eddy-current sorter. Developed to distinguish between turbine blades of different alloys, hardnesses, and residual stress, sorter generally applicable to parts of simple and complex shape.

## 01 ELECTRONIC COMPONENTS AND CIRCUITS

**B84-10232**

### **HIGH-CYCLE-LIFE LITHIUM CELL**

S. P. S. YEN (CALTECH), B. CARTER (CALTECH), D. SHEN (CALTECH), and R. SOMOANO (CALTECH)

Apr. 1985

**NPO-15921**

**Vol. 8, No. 4, P. 451**

Lithium-anode electrochemical cell offers increased number of charge/discharge cycles. Cell uses components selected for compatibility with electrolyte solvent. These materials are wettable and chemically stable. Low vapor pressure and high electrochemical stability of solvent improve cell packaging, handling, and safety. Cell operates at modest temperatures less than 100 degrees C - and is well suited to automotive, communications, and other applications.

**B84-10233**

### **DISCRIMINATOR AIDS PHASE-LOCK ACQUISITION**

L. M. CARSON (Motorola, Inc.) and F. E. KRASIN (Motorola, Inc.)

Apr. 1985

**NPO-14311**

**Vol. 8, No. 4, P. 453**

Voltage-controlled oscillator in suppressed-carrier detector acquire carrier frequency and phase quickly with help of frequency-discriminator arrangement. To obtain discriminator function, filter bandwidth in quadrature (Q) leg of detector is widened with respect to bandwidth of filter in inphase (I) leg.

**B84-10234**

### **LIGHT-ACTIVATED MICROWAVE DEVICE**

J. MASERJIAN (CALTECH)

Apr. 1985

**NPO-16112**

**Vol. 8, No. 4, P. 453**

Laser-activated microwave semiconductor device switches at microwave speeds, generates pulses, or detects optical pulses with fast response. Device consists essentially of back-to-back metal/thin oxide/silicon (MTOS) capacitors on silicon chip.

**B84-10235**

### **MAGIC-T-COUPLED MAGNETRONS**

R. M. DICKINSON (CALTECH)

Apr. 1985

**NPO-15061**

**Vol. 8, No. 4, P. 454**

Outputs of two magnetrons added coherently in scheme based on resonant waveguide coupling and injection phase locking. In addition, filaments are turned off after starting. Overall effect is relatively-inexpensive, lowpower, noisy magnetrons generate clean carrier signals of higher power that ordinarily require more expensive klystrons.

**B84-10236**

### **LIGHTWEIGHT REGULATED POWER SUPPLY**

C. W. MCLYMAN (CALTECH)

Apr. 1985

**NPO-15977**

**Vol. 8, No. 4, P. 455**

Power-supply circuit regulates output voltage by adjusting frequency of chopper circuit according to variations. Currently installed in battery charger for electric wheelchair, circuit is well suited to other uses in which light weight is important - for example, in portable computers, radios, and test instruments.

**B84-10237**

### **ANTENNA SUBREFLECTOR FED BY A LINE SOURCE**

A. C. BROWN JR. (Goodyear Aerospace Corp.) and G. D. BRUNNER (Goodyear Aerospace Corp.)

Apr. 1985

**MSC-20626**

**Vol. 8, No. 4, P. 456**

Additional antenna design options made available by subreflector concept for converting cylindrical waves into spherical waves. Waves used to feed main reflector that shapes radiation pattern into pencil beam for point-to-point communication or into fan beam for aircraft tracking, space surveillance, or directional beacon transmission.

**B84-10238**

### **ELLIPSOIDAL BALLOON ANTENNA**

P. W. CRAMER (CALTECH)

Apr. 1985

**NPO-15931**

**Vol. 8, No. 4, P. 457**

Direct-broadcast ellipsoidal antenna 40 percent smaller than spherical reflector. Balloon antenna has feedpoint on surface of ellipsoid outside balloon, simplifying balloon deployment and feed support. Dielectric shrouds used locally to adjust shape of balloon and maintain feed distance at its optimum value.

**B84-10239**

### **EFFICIENT REFLECTOR ANTENNA**

D. A. BATHKER (CALTECH), A. G. CHA (CALTECH), V. GALINDO (CALTECH), and H. F. REILLY (CALTECH)

Apr. 1985

**NPO-16262**

**Vol. 8, No. 4, P. 458**

Efficient antenna applicable to systems where main reflector diameter is at least 500 wavelengths. Design provides 2-to-3-dB improvement in gain divided by noise temperature (G/T) over centerline symmetric designs. Performance improvement largely due to clear-aperture, off-axis dual-reflector design.

**B84-10240**

### **MEASURING THE CONTACT RESISTANCES OF PHOTO-VOLTAIC CELLS**

D. R. BURGER (CALTECH)

Apr. 1985

**NPO-16168**

**Vol. 8, No. 4, P. 459**

Simple method devised to measure contact resistances of photovoltaic solar cells. Method uses readily available equipment and applicable at any time during life of cell. Enables evaluation of cell contact resistance, contact-end resistance, contact resistivity, sheet resistivity, and sheet resistivity under contact.

**B84-10241**

### **ESTIMATION OF GROUNDING-STRAP RESISTANCES**

R. Q. JACKSON (Rockwell International Corp.)

Apr. 1985

**MSC-20694**

**Vol. 8, No. 4, P. 460**

Two formulas and set of tabulated values used for calculations of resistances of electrical grounding straps. Tabulated values take into account resistances of terminal crimps as well as resistance of straps alone. Equations apply to thin metal strips, woven braids, and stranded jumpers.

**B84-10242**

### **MEASURING AIR-IONIZER OUTPUT**

J. O. LONBORG (CALTECH)

Apr. 1985

**NPO-16058**

**Vol. 8, No. 4, P. 461**

Test apparatus checks ion content of airstream from commercial air ionizer. Apparatus ensures ion output is sufficient to neutralize static charges in electronic assembly areas and concentrations of positive and negative ions are balanced.

**B84-10243**

### **GUARD FOR FUSE CAPS**

D. C. ATWELL (McDonnell Douglas Corp.)

Apr. 1985

**KSC-11283**

**Vol. 8, No. 4, P. 461**

L-shaped guard attached to fuse holder. Guard prevents casual tampering with fuses in electrical junction box or fuse block. Protects fuses from being damaged by handling or by rope or string used to secure them. With fuse-cap guard, only responsible people have access to fuses.

**B84-10244**

### **BATTERIES FOR ELECTRIC VEHICLES**

R. A. CONOVER (CALTECH)

Apr. 1985

**NPO-15142 Vol. 8, No. 4, P. 462**

Report summarizes results of test on 'near-term' electrochemical batteries - (batteries approaching commercial production). Nickel/iron, nickel/zinc, and advanced lead/acid batteries included in tests and compared with conventional lead/acid batteries. Batteries operated in electric vehicles at constant speed and repetitive schedule of accelerating, coasting, and braking.

**B84-10245 THEORETICAL INVESTIGATION OF DIELECTRIC HORN ANTENNAS**

J. K. RAINES (Raines Engineering)  
Apr. 1985

**GSC-12876 Vol. 8, No. 4, P. 462**

Mathematical model applicable to both solid and hollow dielectric horn antennas implemented in computer program. Conventional hollow metal horns have several disadvantages: difficult to fabricate at short wavelengths and conducting properties of metal tend to deteriorate with increasing frequency. Dielectric horns offer advantages over conventional metal horns. Computer program permits user to investigate potential of various dielectric antenna designs.

**B84-10246 REDUCING STEPPING-MOTOR POWER CONSUMPTION**

C. J. WILLIAMS (The Perkin Elmer Corporation)

Apr. 1985

**MFS-25119 Vol. 8, No. 4, P. 463**

Direct-current stepping motors used in computer peripherals, process control, and precision remote-positioning equipment constantly dissipate power and create heat even when not moving. Circuit design energizes stepper motor only when pulses are present on control input.

**B84-10247 DETECTING THE POLARITY OF LIGHTNING STRIKES**

R. L. GRUMM (CALTECH)

Apr. 1985

**NPO-16063 Vol. 8, No. 4, P. 463**

Recording technique using audio tape recorder determines polarity of lightning discharges. Information important in design of lightning-protection equipment for powerlines and other exposed systems.

**B84-10248 CALCULATING STRAIN RELIEF IN ELECTRONIC-COMPONENT LEADS**

H. SNYTSHEUVEL (TRW, Inc.)

Apr. 1985

**MSC-20416 Vol. 8, No. 4, P. 463**

Stress/strain formulas applicable to design of electronic-component leads compiled in report. Such things as factors of safety and whether or not lead is likely to fail in service determined in advance. Set of formulas is simple enough to be solved on programable hand-held calculator.

**B84-10249 TEMPERATURE COMPENSATION FOR A FREQUENCY-MODULATED OSCILLATOR**

R. H. HESSE (TRW, Inc.)

Apr. 1985

**MSC-20556 Vol. 8, No. 4, P. 463**

Carrier frequency and deviation ratio of frequency-modulated oscillator maintained nearly constant by temperature-compensating circuit.

**B84-10250 SOLID-STATE LATCHING RELAY**

C. W. MCCLYMAN (CALTECH)

Apr. 1985

**NPO-15028 Vol. 8, No. 4, P. 464**

Latching relay requiring only single coil activated by trigger pulse and remains latched for timed interval during which it is immune to additional trigger pulses and noise.

**B84-10251 PULSED-CURRENT TRANSDUCERS**

S. S. NAGANO (CALTECH)

Apr. 1985

**NPO-14048 Vol. 8, No. 4, P. 464**

Diode circuit linearizes output of pulsating dc transducers. Circuit consists of diode in series with sensing resistor placed across secondary winding of transducer transformer.

**B84-10252 PLATINUM-RESISTOR DIFFERENTIAL TEMPERATURE SENSOR**

R. B. KOLBLY (CALTECH) and M. J. BRITCLIFFE (CALTECH)

Apr. 1985

**NPO-15666 Vol. 8, No. 4, P. 464**

Platinum resistance elements used in bridge circuit for measuring temperature difference between two flowing liquids. Temperature errors with circuit are less than 0.01 degrees C over range of 100 degrees C.

**B84-10253 DETERMINING THE LIFE EXPECTANCY OF PHOTOVOLTAIC SYSTEMS**

A. R. HOFFMAN (CALTECH), J. S. GRIFFITH (CALTECH), and P. JAFFE (CALTECH)

Apr. 1985

**NPO-15683 Vol. 8, No. 4, P. 464**

Several tests used to determine adequacy of photovoltaic systems, their modules, and materials to survive in real environments. Tests include outdoor testing of systems, real-time and accelerated outdoor testing of modules and materials, and laboratory testing of modules and materials.

**B84-10254 IMPROVED OPTICAL KEYBOARD**

R. S. JAMIESON (CALTECH)

Apr. 1985

**NPO-15132 Vol. 8, No. 4, P. 464**

Optical keyboard surfaces used in typewriters, computer terminals, and telephone inexpensively fabricated using stack of printed-circuit cards set in laminate. Internal laminations carry all illuminating and sensing light conductors to keys.

**B84-10255 HALL-EFFECT GROUND-FAULT INTERRUPTOR**

L. OKIN (Underwriters Laboratories, Inc.)

Apr. 1985

**NPO-15915 Vol. 8, No. 4, P. 464**

Tested ground-fault interruption circuit utilizing Hall-effect device to sense differential current in magnetic core tips and opens circuit.

## 02 ELECTRONIC SYSTEMS

**B84-10026 FAST DUAL ANALOG-TO-DIGITAL CONVERTER**

D. E. WALLIS (CALTECH) and R. R. GREEN (CALTECH)

Jan. 1985

**NPO-15006 Vol. 8, No. 3, P. 329**

Unit delivers blocks of quadrature data to computer memory. Contains 105 integrated circuit packages in 19 by 3 1/2 inch (48.26 by 8.39 cm) rack mounted drawer with internal force air blower. Intended for synchronous sampling of quadrature pairs of data, samples with minimal skew (about 10 nanoseconds) using video-type high-speed sampling technology. Unit equipped for computer controlled

## 02 ELECTRONIC SYSTEMS

self-testing. Originally developed for planetary radar data-acquisition system.

### **B84-10027 WIRE-IDENTIFICATION INSTRUMENT**

J. O. LONBORG (CALTECH)

Jan. 1985

**NPO-15633**

**Vol. 8, No. 3, P. 330**

Instrument automatically tests each wire in multiwire cable and identifies specified wire to be segregated or labeled and locates wire connected to specified connector pin. Instrument made with readily available CMOS integrated circuits. More efficient and reliable than conventional continuity testers and less expensive than computer controlled units.

### **B84-10028 AUTOMATIC MONITORING OF SWITCHING POWER SUPPLIES**

R. L. MOSER (Martin Marietta Corp.)

Jan. 1985

**MFS-25968**

**Vol. 8, No. 3, P. 351**

Fast analysis of switching waveforms allows detection of impending failures. Switching power conditioner converts dc power from source such as battery or solar cell array to well regulated dc at convenient voltages and currents. Concept originally developed for space stations and spacecraft also suitable for power conditioning equipment in aircraft and in terrestrial photovoltaic power systems.

### **B84-10029 INTERCOMPUTER COMMUNICATION LINK**

W. A. LUSHBAUGH (CALTECH) and J. W. LAYLAND (CALTECH)

Jan. 1985

**NPO-13446**

**Vol. 8, No. 3, P. 331**

Interface units transmit, receive, and perform 'handshaking' functions. Two computers communicate over distance up to 6700 meters at average transmission speeds around 200 kilobaud with help of pair of programable interface units. Interfaces use form of pulse modulation and are programed for full 'handshaking' capabilities.

### **B84-10030 OPTICAL QUANTUM RECEIVER FOR BINARY SIGNALS**

V. A. VILNROTTER (CALTECH)

Jan. 1985

**NPO-15122**

**Vol. 8, No. 3, P. 332**

In quantum optical receiver, both amplitude and phase of received optical signal measured to extract as much information as possible, thereby reducing error probability. Phase-modulated received signal mixed with equal amplitude replica of optical carrier generated in phase locked loop. Two signals interfere with each other at photomultiplier cathode. Probability of error with this scheme close to theoretical minimum and implemented with current technology.

### **B84-10031 MONITORING PERFORMANCE OF COMPLEX SYSTEMS**

W. F. THOMAS

Jan. 1985

**KSC-11273**

**Vol. 8, No. 3, P. 333**

33-page report describes use of computers in automatic on-line monitoring of Centaur rocket prior to launch. Computers analyze measurements and verify events and commands. System uses adaptive software so only real problems are detected and brought to attention of engineers. Software techniques transferable to such industrial uses as batch process control and production line automation.

### **B84-10032 REPORT ON SATELLITE RADAR FOR DETECTING OCEAN CURRENTS**

A. JAIN (CALTECH)

Jan. 1985

**NPO-15704**

**Vol. 8, No. 3, P. 333**

Good resolution and high signal/noise ratio anticipated. Report describes orbiting sidelooking radar that measures ocean currents in direction toward or away from it. Radar relies on relationship between Doppler shifts and lengths and frequencies of ocean waves.

**B84-10033**

### **COST AND PERFORMANCE OF DISTRIBUTED PHOTOVOLTAIC SYSTEMS**

C. S. BORDEN (CALTECH) and M. C. DAVISSON (CALTECH)

Jan. 1985

**NPO-16001**

**Vol. 8, No. 3, P. 334**

Lifetime Cost and Performance (LCP) model assists in design of Photovoltaic (PV) systems. LCP simulation of performance, cost and revenue streams associated with distributed PV power systems. Provides user with substantial flexibility in specifying technical and economic environment of PV application.

**B84-10034**

### **ELECTRIC/HYBRID VEHICLE SIMULATION**

R. A. SLUSSER (CALTECH), C. P. CHAPMAN (CALTECH), and J. P. BRENNAND (General Research Corp.)

Jan. 1985

**NPO-15229**

**Vol. 8, No. 3, P. 334**

ELVEC computer program provides vehicle designer with simulation tool for detailed studies of electric and hybrid vehicle performance and cost. ELVEC simulates performance of user-specified electric or hybrid vehicle under user specified driving schedule profile or operating schedule. ELVEC performs vehicle design and life cycle cost analysis.

**B84-10035**

### **LRU VOLTAGE ANALYSIS**

T. OEPOMO (Rockwell International Corp.) and T. PROUTY (Rockwell International Corp.)

Jan. 1985

**MSC-20699**

**Vol. 8, No. 3, P. 335**

Program for analyzing line replacement unit (LRU) voltages in shuttle orbiter predicts minimum voltage level of main power distribution bus needed to meet predetermined LRU voltage. Loads constant-power or resistive. In some cases fed from two or three sources through diodes.

**B84-10036**

### **FRONT-END PROGRAM FOR SYSGEN**

C. R. CARLSON (CALTECH) and M. DAVISSON (CALTECH)

Jan. 1985

**NPO-15782**

**Vol. 8, No. 3, P. 335**

SYSGEN, Power Generation System Production costing and Reliability Analysis program, simulates production costs and reliability of electric utility with and without time-dependent generating units. FEPS transforms inputs into proper formats, builds data files and adds Job Control Language necessary to running SYSGEN program.

**B84-10037**

### **MULTIPLE-USER ADAPTIVE-ARRAY COMMUNICATION SYSTEM**

S. ZOHAR (CALTECH)

Jan. 1985

**NPO-15765**

**Vol. 8, No. 3, P. 335**

Weights for K-beam system computed K/6 times faster. In single-frequency adaptive-array communication system in which K mobile users communicate with central station equipped with n-antenna array. Each K signal recoverable by taking specific weighted sum of n complex antenna voltages.

**B84-10038**

### **CAPACITOR-TEST SYSTEM**

F. M. OTT (CALTECH) and R. A. SUMMERS (CALTECH)

Jan. 1985

**NPO-16485**

**Vol. 8, No. 3, P. 336**

Polycarbonate film capacitors tested for leakage paths with microprocessor controlled multiplexer test sequence. Microprocessor based capacitor test system simultaneously monitors 80 capacitors.

**B84-10039  
IMPROVED ULTRASONIC RESOLUTION VIA ANALOG TECHNIQUE**

P. M. GAMMELL (CALTECH)

Jan. 1985

**NPO-15707**

**Vol. 8, No. 3, P. 336**

High spatial resolution obtained from reflected or transmitted ultrasonic pulses by analog technique that produces signal proportional to magnitude of complex plane analytic representation of signal.

**B84-10040  
REMOVING DRIFT FROM FREQUENCY-STABILITY MEASUREMENTS**

C. A. GREENHALL

Jan. 1985

**NPO-15833**

**Vol. 8, No. 3, P. 336**

Method for eliminating frequency drifts from frequency stability measurements produces more accurate indication of stability of such frequency standard as hydrogen maser.

**B84-10041  
REMOTE-IMAGING PARAMETERS**

R. F. RICE (CALTECH)

Jan. 1985

**NPO-14869**

**Vol. 8, No. 3, P. 336**

Image resolution, image quality and data transmission rate of remote imaging systems continuously controlled by operator intervention. Set of levers allows operator to control independently frame rate, frame size and image quality in bits per pixel. System used for imaging systems in aircraft or remotely piloted vehicles.

**B84-10042  
PROGRAMMABLE MULTICRATE CONTROLLER**

G. L. MOOK (McDonnell Douglas Corp.) and M. R. PHILLIPS (McDonnell Douglas Corp.)

Jan. 1985

**MFS-25533**

**Vol. 8, No. 3, P. 336**

High-speed, environmentally hardened controller developed for use with commercially available system crates for both experiment control and data handling. Programmable crate controller consists of three functional areas: control section utilizes high-speed bit-slice circuitry, memory, and data way interface.

**B84-10043  
EYE-MOVEMENT TRACKER WOULD REDUCE VIDEO BANDWIDTH**

C. F. RUOFF (CALTECH)

Jan. 1985

**NPO-15432**

**Vol. 8, No. 3, P. 337**

Bandwidth required to transmit closed circuit television image reduced by transmitting small portion at high resolution and remainder at low resolution. High-resolution portion centered in viewer's gaze so entire image seems to be of high resolution.

**B84-10044  
ELIMINATING FALSE SIGNALS FROM ELECTROMECHANICAL KEYBOARDS**

C. F. SCHOTT (Rockwell International Corp.)

Jan. 1985

**MSC-20429**

**Vol. 8, No. 3, P. 337**

Contact switches in electromechanical keyboards prone to 'bounce' creation of unwanted pulses that interfere with digital systems. New adapter unit eliminates bounce without separate power supply.

**B84-10045  
LOW-FREQUENCY NAVIGATIONAL SYSTEM**

D. E. WALLIS (CALTECH)

Jan. 1985

**NPO-15264**

**Vol. 8, No. 3, P. 337**

Accurate vehicle position determination over 50 by 50-km service area accomplished by low-frequency-radio navigational system comprised of four frequency/phase comparison transmitters and receivers. Use of grid-calibration table permits accurate position determination in vehicle receiver system.

**B84-10046  
TRANSFER-FUNCTION SIMULATOR**

M. J. KAVAYA (CALTECH)

Jan. 1985

**NPO-15696**

**Vol. 8, No. 3, P. 337**

Transfer function simulator constructed from analog or both analog and digital components substitute for device that has faults that confound analysis of feedback control loop. Simulator is substitute for laser and spectrophone.

**B84-10047  
OPTICAL MASS MEMORY SYSTEM SPECIFICATION**

Innovator Not Given (Harris Corp.)

Jan. 1985

**MFS-25592**

**Vol. 8, No. 3, P. 337**

Specifications given for computer controlled optical mass memory system that stores and retrieves data from silver halide films 148-mm square and 7 mils (0.18mm) thick at user bit density of 30 Mbit/in. 2 (4.7 Mbit/cm<sup>2</sup>) with uncorrectable bit-error rate of 10 to negative 9th power or less. Allows for expansion to 10 the 15th power bit capacity.

**B84-10048  
REED-SOLOMON ENCODER**

T. K. TROUNG (CALTECH), I. S. REED (CALTECH), L. J. DEUTSCH (CALTECH), I. S. HSU (CALTECH), K. WANG (CALTECH), and C. S. YEH (CALTECH)

Jan. 1985

**NPO-16074**

**Vol. 8, No. 3, P. 337**

Report presents mathematical principles of Berlekamp bit serial multiplier algorithm and its application to design of very-large-scale integrated (VLSI) encoders for Reed-Solomon error-correcting codes. Structure made readily on single chip of negatively doped channel metal oxide semiconductor.

**B84-10049  
NORMALIZING VFO FREQUENCY BY NON-POWER-OF-2 DIVISION**

C. R. ANDERSON (Odetics, Inc.)

Jan. 1985

**NPO-15330**

**Vol. 8, No. 3, P. 338**

PLL oscillator with VFO operating at one frequency yields any one of four frequencies by dividing by 4, 7, 21, or 52.5. Radiation resistant phase-locked loop oscillator generates output frequency 32 times any 1 or 4 specific input reference frequencies constructed without increasing component count over that of conventional circuit.

**B84-10256  
DIRECT-PHOTON-DETECTION COMMUNICATIONS**

J. R. LESH (CALTECH) and J. KATZ (CALTECH)

Apr. 1985

**NPO-15905**

**Vol. 8, No. 4, P. 467**

Optical communications system based on direct detection of photons rather than heterodyning of carrier with local oscillator. Direct-detection system uses single laser source, pulse-position modulation, and Reed-Solomon coding to protect against burst errors. Conventional photomultiplier tube is receiver. Technology applicable to terrestrial communications.

**B84-10257  
ESTIMATES OF SMALL SIGNAL/NOISE RATIOS**

L. D. HOWARD (CALTECH)

Apr. 1985

**NPO-15653**

**Vol. 8, No. 4, P. 468**

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Signal/Noise Ratio Meter measures ratio of signal power to noise power in input that contains both signal and noise. Signal and noise first filtered and normalized in analog circuitry, then digitized and sampled. Performance of SNR meter determined by statistical algorithm chosen for analysis of samples.

**B84-10258**

**PROXIMITY INDICATOR FOR REMOTE MANIPULATOR**  
A. K. BEJCZY (CALTECH)

Apr. 1985

**NPO-15064**

**Vol. 8, No. 4, P. 468**

Display indicates pitch, yaw, and distance of remote manipulator with respect to object to be grasped. Displays numerical values and bargraph simulation of position and orientation of hand. When errors in position and orientation are small enough to ensure successful grasp, unit alerts operator with audible and visible signals.

**B84-10259**

**CONTROLLING SOLAR-POWER SYSTEMS WITH DISTRIBUTED PROCESSORS**

M. S. IMAMURA (Martin Marietta Corp.) and R. L. MOSER (Martin Marietta Corp.)

Apr. 1985

**NPO-15101**

**Vol. 8, No. 4, P. 469**

System undergoing development uses distributed microprocessors to monitor and control photovoltaic power system. Equipment increases life expectancy and reliability of power system and decreases costs. Adapted to vehicular, residential, and commercial solar and nonsolar power systems. Equipment especially desirable in systems with overall power levels above few kilowatts.

**B84-10260**

**MEASURING TRACKING ACCURACY OF CCD IMAGERS**  
R. H. STANTON (CALTECH) and E. W. DENNISON (CALTECH)

Apr. 1985

**NPO-15665**

**Vol. 8, No. 4, P. 470**

Tracking accuracy and resolution of charge-coupled device (CCD) imaging arrays measured by instrument originally developed for measuring performance of star-tracking telescope. Operates by projecting one or more artificial star images on surface of CCD array, moving stars in controlled patterns, and comparing star locations computed from CCD outputs with those calculated from step coordinates of micropositioner.

**B84-10261**

**PRIORITY QUEUING ON A PARALLEL DATA BUS**  
D. E. WALLIS (CALTECH)

Apr. 1985

**NPO-15005**

**Vol. 8, No. 4, P. 471**

Queuing strategy for communications along shared data bus minimizes number of data lines while always assuring user of highest priority given access to bus. New system handles up to 32 user demands on 17 data lines that previously serviced only 17 demands.

**B84-10262**

**TARGET SIMULATOR FOR SYNTHETIC-APERTURE RADARS**

H. A. ZEBKER (CALTECH), D. N. HELD (CALTECH), R. M. GOLDSTEIN (CALTECH), and T. C. BICKLER (CALTECH)

Apr. 1985

**NPO-15024**

**Vol. 8, No. 4, P. 471**

In proposed Target Simulator for Testing Synthetic-Aperture Radars, radar transmitter output received, mixed down to video frequencies, and passed through variable digital delay. Delayed signal mixed up to original carrier frequency and transmitted back to radar. Synthetic-aperture radar (SAR) generates return signal that contains range-curvature information in addition to Doppler-frequency information.

**B84-10263**

**SYNCHRONIZED RADAR-TARGET SIMULATOR**

B. C. CHIN (Hughes Aircraft Co.)

Apr. 1985

**MSC-20240**

**Vol. 8, No. 4, P. 472**

Apparatus for testing radar system generates signals that simulate amplitude and phase characteristics of target returns and their variation with antenna-pointing direction. Antenna movement causes equipment to alter test signal in imitation of behavior of real signal received during tracking.

**B84-10264**

**ESTIMATING DOPPLER SHIFTS FOR SYNTHETIC-APERTURE RADAR**

J. C. CURLANDER (CALTECH)

Apr. 1985

**NPO-15990**

**Vol. 8, No. 4, P. 473**

Quality of synthetic-aperture-radar (SAR) imagery enhanced by pair of signal-processing techniques that compensate for relative motion between target and vehicle. Combining vehicle trajectory data with radar-parameter and raw image data, techniques generate Doppler estimates for use in constructing fully processed images.

**B84-10265**

**CONTOUR-MAPPING SYNTHETIC-APERTURE RADAR**

R. M. GOLDSTEIN (CALTECH), E. R. CARO (CALTECH), and C. WU (CALTECH)

Apr. 1985

**NPO-15939**

**Vol. 8, No. 4, P. 474**

Airborne two-antenna synthetic-aperture-radar (SAR) interferometric system provides data processed to yield terrain elevation as well as reflected intensity information. Relative altitudes of terrain points measured to within error of approximately 25 m.

**B84-10266**

**FIBER-OPTIC EQUIPMENT FOR POWER-SYSTEM CONTROL**

A. O. BRIDGEFORTH (CALTECH) and L. C. YANG (CALTECH)

Apr. 1985

**NPO-15968**

**Vol. 8, No. 4, P. 476**

Report surveys state of art in fiber optics and explores use of microprocessors communicating over optical fibers to control complicated power system with many producing and consuming units. Power system of study is of planetary spacecraft, and fiber-optic technology extension of that now under development or used in military aircraft and ships.

**B84-10267**

**CONVOLUTIONALLY-CODED UNBALANCED QPSK SYSTEMS**

D. DIVSALAR (CALTECH) and J. H. YUEN (CALTECH)

Apr. 1985

**NPO-15566**

**Vol. 8, No. 4, P. 476**

Report discusses error-rate performance for three convolutionally coded unbalanced quadrature-phase-shift-keying (UQPSK) communication systems with noisy carriers that introduce crosstalk. Systems analyzed unbalanced in sense that each transmits two data streams with different bit rates and (in some cases) different powers.

**B84-10268**

**INTERACTIVE DIGITAL SIGNAL PROCESSOR**

W. H. MISH

Apr. 1985

**GSC-12862**

**Vol. 8, No. 4, P. 477**

Interactive Digital Signal Processor, IDSP, consists of set of time series analysis 'operators' based on various algorithms commonly used for digital signal analysis. Processing of digital signal time series to extract information usually achieved by applications of number of fairly standard operations. IDSP excellent teaching tool for demonstrating application for time series operators to artificially generated signals.



**B84-10269**  
**SHORT-RANGE DIGITAL OPTICAL LINKS**  
 R. M. DICKINSON (CALTECH)

Apr. 1985  
**NPO-15999**

Vol. 8, No. 4, P. 477

Concept based on multiple optoelectronic chips. Proposed network of semiconductor lasers used for communication and radar. Network includes small integrated transmitters, receivers, and data processors placed at strategic points on station and vehicles.

**B84-10270**  
**COMMUNICATION PROGRAM EMULATES SWITCH-BOARD**

D. RON (Rockwell International Corp.)  
 Apr. 1985

**MFS-19917**

Vol. 8, No. 4, P. 477

Software allows microprocessor systems to communicate with external devices. Flexible program completely menu-driven, and all local operator commands require only single keystroke.

**B84-10271**  
**DIGITAL RATIOMETER**  
 R. BEER

Apr. 1985

**NPO-15396**

Vol. 8, No. 4, P. 477

Small, low-cost comparator with 24-bit-precision yields ratio signal from pair of analog or digital input signals. Arithmetic logic chips (bit-slice) sample two 24-bit analog-to-digital converters approximately once every millisecond and accumulate them in two 24-bit registers. Approach readily modified to arbitrary precision.

**B84-10272**  
**BISTATIC SYNTHETIC-APERTURE RADAR**

C. ELACHI (CALTECH), R. GOLDSTEIN (CALTECH), and D. HELD (CALTECH)

Apr. 1985

**NPO-15619**

Vol. 8, No. 4, P. 478

Report describes synthetic-aperture radar that uses spaceborne transmitter and ground (or airborne) receiver to obtain imaging data in real time. System has applications in vessel navigation in open seas and polar ice regions, monitoring of wave and ice patterns near shores and oil platforms, and continuous monitoring of region with repeat time of few hours or less.

**B84-10273**  
**IMAGING SYSTEM FOR HIGH-TEMPERATURE PROCESSES**

T. A. GLAVICH (CALTECH)

Apr. 1985

**NPO-15945**

Vol. 8, No. 4, P. 478

Borescope/camera arrangement used for viewing silhouette image of specimen levitated inside furnace. System adapted for monitoring other processes in enclosures.

**B84-10274**  
**QUICKER SELECTION OF CCD IMAGES**

P. M. SALOMON (CALTECH) and K. SMILOWITZ (CALTECH)

Apr. 1985

**NPO-15345**

Vol. 8, No. 4, P. 478

Microprocessor limits analog-to-digital conversion to image areas of interest. Image region of interest selected in order of brightness by use of threshold detectors and their coordinates stored by microprocessor for tracking.

**B84-10275**  
**HIGH-RESOLUTION CHARGE-COUPLED-DEVICE CAMERA**

M. C. CLARY (CALTECH), K. P. KLAASEN (CALTECH), L. M. SNYDER (CALTECH), and P. K. WANG (CALTECH)

Apr. 1985

**NPO-15086**

Vol. 8, No. 4, P. 478

800-by-800-element sensor and lens of 1.5-m focal length used in camera with 0.01-mrad resolution.

**B84-10276**

**PACKET TELEMETRY AND PACKET TELECOMMAND**  
 A. J. HOOKE (CALTECH) and E. GREENBERG (CALTECH)

Apr. 1985

**NPO-16301**

Vol. 8, No. 4, P. 478

Two communication protocols for telemetry and telecommand reduce amount of required hardware and software and facilitate bidirectional information exchange.

## 03 PHYSICAL SCIENCES

**B84-10050**  
**INTERFEROMETER MEASURES BROADBAND SURFACE ACOUSTIC WAVES**

R. O. CLAUS (Virginia Polytechnic Institute and State University) and T. TURNER (Virginia Polytechnic Institute and State University)

Jan. 1985

**LAR-12966**

Vol. 8, No. 3, P. 341

Dual differential interferometer uses two pairs of orthogonally polarized optical beams to measure amplitude and orientation of broadband ultrasonic surface acoustic waves. Instrument modular, and sensitivity limited only by optical detector used.

**B84-10051**  
**ACOUSTIC GAUSSIAN FAR-FIELD PATTERN**

R. O. CLAUS (Virginia Polytechnic Institute and State University) and P. S. ZERWEKH (Virginia Polytechnic Institute and State University)

Jan. 1985

**LAR-12967**

Vol. 8, No. 3, P. 342

Gaussian profile achieved by using annular electrodes. Transducer constructed by depositing circularly symmetric metallic multielectrode array on 12.7 mm diameter X-cut quartz disk. Each electrode independently connected to impedance network optimized to produce Gaussian distribution with less than 2 percent error. Ultrasonic transducer produces far field beam with Gaussian spatial profile for materials evaluation applications.

**B84-10052**  
**RECEIVER FOR SOLAR AIR TURBINE**

A. KOFAL (The Boeing Co.), R. SHANNON (The Boeing Co.), and D. K. ZIMMERMAN (The Boeing Co.)

Jan. 1985

**NPO-15124**

Vol. 8, No. 3, P. 343

Solar receiver heats air to temperature high enough to drive gas turbine. Receiver has thermal output of about 70 kilowatts. Pointing downward at focal position of solar reflector, proposed receiver accepts intense concentrated sunlight. Although temperatures in receiver may rise to 1,500 degrees F (816 degrees C) or more, calculations show receiver loses less than 10 percent of insolation by convection through aperture. Receiver designed for 30-year life without scheduled maintenance or replacement.

**B84-10053**  
**ANGLE-MEASUREMENT AND RANGING SYSTEM**

J. C. TIETZ (Martin Marietta Corp.)

Jan. 1985

**MFS-25912**

Vol. 8, No. 3, P. 344

Optical system automatically supplies information on

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angular position and range of object. Stereo rangefinder video signals from cameras processed to determine center of brightness for images of beacon on target vehicle. Range updated by onboard computer. Originally developed for spacecraft rendezvous and guidance, features of system adapted to angle-measurement and ranging problems on Earth. Technique also used for tool alignment inspections and color recognition.

#### **B84-10054 ZERO-NET-CHARGE AIR IONIZER**

W. R. WOODS JR. (CALTECH)

Jan. 1985

**NPO-15937**

**Vol. 8, No. 3, P. 345**

Instrument monitors air supplied by air ionizer and regulates ionizer to ensure net charge neutral. High-impedance electrometer and nulling control amplifier regulate output of air ionizer. Primarily intended to furnish ionized air having no net charge, instrument adaptable to generating air with positive or negative net charge is so desired. Useful where integrated circuit chips are manufactured, inspected, tested or assembled.

#### **B84-10055 CONVECTIVE OSCILLATIONS AT CRYSTAL/MELT INTERFACE**

M. GLICKSMAN (Rensselaer Polytechnic Institute), S. CORIELL (National Bureau of Standards), and R. BOISVERT (National Bureau of Standards)

Jan. 1985

**MFS-25892**

**Vol. 8, No. 3, P. 345**

Oscillatory instability in shape of solid/liquid interface geometry observed in heat-transfer experiments in long, thin vertical cylinder filled with succinonitrile. Novel fluid flow configuration with cylindrical symmetry developed to permit detailed heat flow experiments in geometry also mathematically tractable.

#### **B84-10056 ASSESSING ENERGY-GENERATING SYSTEMS**

R. G. CHAMBERLAIN (CALTECH), K. M. MCMASTER (CALTECH), and M. C. DAVISSON (CALTECH)

Jan. 1985

**NPO-16159**

**Vol. 8, No. 3, P. 346**

Economics of user specified thermal and electrical systems analyzed. OMEGA finds normative prices and break-even values of system parameters. Applies to electrical and thermal energy generation systems owned by utility, business or consumer.

#### **B84-10057 A GENERAL OPTICAL SYSTEMS EVALUATION PROGRAM**

M. WILSON and B. HOWELL

Jan. 1985

**GSC-12823**

**Vol. 8, No. 3, P. 346**

General Optical Systems Evaluation Program, GENOPTICS, aids analysis and evaluation of optical systems that employ lenses, mirrors, diffraction gratings and other geometrical surfaces. GENOPTICS uses geometrical ray tracing based on Snell's law.

#### **B84-10058 SOLAR/THERMAL POWERPLANT SIMULATION**

J. M. BOWYER (CALTECH), N. EL GABALAWI (CALTECH), G. M. HILL (CALTECH), and M. L. SLONSKI (CALTECH)

Jan. 1985

**NPO-15440**

**Vol. 8, No. 3, P. 347**

Simulation program evaluates performances and energy costs of diverse solar/thermal powerplant configurations. Approach based on optimizing sizes of collector and storage subsystems to give minimum energy cost for specified plant rating and load factor. Methodology provides for consistent comparative evaluation of solar/thermal powerplants.

#### **B84-10059 THERMOELECTRIC GENERATOR**

T. COLE (CALTECH)

Jan. 1985

**NPO-16164**

**Vol. 8, No. 3, P. 347**

Small modular alkali metal thermoelectric generator with no moving parts directly converts heat to electrical energy with efficiency of 20 to 40 percent. Unit uses closed regenerative electrochemical concentration cell based on sodium-ion conductor beta alumina.

#### **B84-10060 SOFT-X-RAY PREFILTER FOR HOT, BRIGHT OBJECTS**

J. M. DAVIS (American Science & Engineering, Inc.) and J. A. ORTENDAHL (American Science & Engineering, Inc.)

Jan. 1985

**NPO-15972**

**Vol. 8, No. 3, P. 347**

Prefilters consisting of beryllium foil supported on conductive silver mesh transmit soft x-rays but are nearly opaque to visible and infrared light. New Be/AG filters protect imaging X-ray detectors from damage by visible and longer wavelength radiation when viewing such hot, bright emitters as Sun or possibly certain industrial processes.

#### **B84-10061 FREQUENCY-MODULATION CORRELATION SPECTROMETER**

J. S. MARGOLIS (CALTECH) and J. V. MARTONCHIK (CALTECH)

Jan. 1985

**NPO-15558**

**Vol. 8, No. 3, P. 347**

New type of correlation spectrometer eliminates need to shift between two cells, one empty and one containing reference gas. Electrooptical phase modulator sinusoidally shift frequencies of sample transmission spectrum.

#### **B84-10062 PUMP-FED VERSUS PRESSURE-FED PROPULSION**

P. N. ESTEY (CALTECH)

Jan. 1985

**NPO-15190**

**Vol. 8, No. 3, P. 348**

Pumping system has lower mass. Equations worked out to compare masses of pump and pressure-fed bipropellant propulsion systems. Equations developed specifically for interplanetary spacecraft but technique adaptable to advanced automotive energy-storage techniques.

#### **B84-10063 MONITORING OF REACTIVE ATMOSPHERIC SPECIES**

C. R. WEBSTER (CALTECH)

Jan. 1985

**NPO-15981**

**Vol. 8, No. 3, P. 348**

Reactive atmospheric species produced and detected to provide reference spectra. Compact device insensitive to scattered light and has low power consumption.

#### **B84-10064 THERMAL-EXPANSION MEASUREMENT**

J. H. DAVIS (University of Alabama) and C. RIVES (University of Alabama)

Jan. 1985

**MFS-27000**

**Vol. 8, No. 3, P. 348**

Precise stable laser system determines coefficients of thermal expansion. Dual-beam interferometer arrangement monitors changes in sample length as function of temperature by following changes in optical path lengths.

#### **B84-10065 INTEGRATED SYSTEM FOR ENVIRONMENTAL SIMULATION**

R. UDA (Planning Research Corp.), S. DANDAGE (Planning Research Corp.), and D. MACDONALD (Planning Research Corp.)

Jan. 1985

**KSC-11274**

**Vol. 8, No. 3, P. 348**

Integrated testing system subjects ground-support

equipment for Space Shuttle to conditions that prevail during launch. Concept also applies to testing other equipment that must function faultlessly in difficult environment.

**B84-10066  
FLEXIBLE MIRROR MOUNT FOR MICHELSON INTERFEROMETER**

G. S. PERKINS (CALTECH)

Jan. 1985

**NPO-15746**

**Vol. 8, No. 3, P. 348**

Interferometer mirrors mounted on flexible spring strips. Mounts used in folded-beam Michelson interferometer designed to monitor pollutants at altitude of 40,000 meters.

**B84-10067  
ADJUSTABLE-FREQUENCY SPECTROPHONE LASER STABILIZATION**

M. J. KAVAYA (CALTECH) and R. T. MENZIES (CALTECH)

Jan. 1985

**NPO-15516**

**Vol. 8, No. 3, P. 348**

Gas laser frequency stabilizing system includes sensitive spectrophone that senses dither modulation of frequency of laser beam, producing Lorentzian, Voigt, or Doppler spectral tuning response.

**B84-10068  
EVALUATING SOLAR COLLECTORS**

L. C. WEN (CALTECH), P. T. POON (CALTECH), W. J. CARLEY (CALTECH), and L. HUANG (U.S. Navy)

Jan. 1985

**NPO-15733**

**Vol. 8, No. 3, P. 349**

Survey discusses several methods for assessing performance of solar-concentrator designs to determine whether given design suitable for given high-temperature solar powered generator system.

**B84-10069  
SOLAR-POWERED WATER DISTILLATION**

F. J. MENNINGER (CALTECH) and R. J. ELDER (CALTECH)

Jan. 1985

**NPO-15894**

**Vol. 8, No. 3, P. 349**

Solar-powered still produces pure water at rate of 6,000 gallons per year. Still fully automatic and gravity-fed. Only outside electric power is timer clock and solenoid-operated valve. Still saves \$5,000 yearly in energy costs and pays for itself in 3 1/2 years.

**B84-10070  
ASSESSING THE PERFORMANCE OF SOLAR ARRAYS**

R. G. ROSS JR. (CALTECH) and C. C. GONZALEZ (CALTECH)

Jan. 1985

**NPO-15277**

**Vol. 8, No. 3, P. 349**

Selected environmental conditions more effective than traditional parameters. Report analyzes selection of reference criteria for comparing performances of photovoltaic arrays.

**B84-10071  
SOLAR-THERMAL-DESALINATION STUDY**

L. D. LEIBOWITZ (CALTECH), T. M. LIU (CALTECH), and H. Q. PHAM (CALTECH)

Jan. 1985

**NPO-15795**

**Vol. 8, No. 3, P. 349**

Survey assessing economic feasibility of advanced solar-thermal technologies for desalination described in report.

**B84-10072  
SUPPORT SYSTEM FOR SOLAR RECEIVERS**

T. KICENIUK (CALTECH)

Jan. 1985

**NPO-15749**

**Vol. 8, No. 3, P. 349**

Hinged split-ring mounts insure safe support of heavy receivers. In addition to safer operation and damage-free

mounting system provides more accurate focusing, and small incremental adjustments of ring more easily made.

**B84-10073  
TESTING FOR SOLAR-ARRAY HOTSPOTS**

C. C. GONZALEZ (CALTECH) and J. C. ARNETT (CALTECH)

Jan. 1985

**NPO-15596**

**Vol. 8, No. 3, P. 350**

Laboratory procedure developed for evaluating hot-spot endurance of photovoltaic modules under field-service conditions. Procedures used for qualification testing of modules.

**B84-10077  
REFLECTING SCHMIDT/LITTROW PRISM IMAGING SPECTROMETER**

J. B. BRECKINRIDGE (CALTECH), N. A. PAGE (CALTECH), R. V. SHACK (CALTECH), and R. R. SHANNON (CALTECH)

Apr. 1985

**NPO-15801**

**Vol. 8, No. 4, P. 481**

High resolution achieved with wide field of view. Imaging Spectrometer features off-axis reflecting optics, including reflecting 'slit' that also serves as field flattener. Only refracting element is prism. By scanning slit across object or scene and timing out signal, both spectral and spatial information in scene are obtained.

**B84-10278  
LASER RANGEFINDER AND REMOTE PROFILOMETER**

J. M. MCLAUCHLAN (CALTECH), J. AUYEUNG (CALTECH), E. F. TUBBS (CALTECH), W. G. GOSS (CALTECH), and D. PSALTIS (CALTECH)

Apr. 1985

**NPO-15865**

**Vol. 8, No. 4, P. 482**

Proposed laser rangefinder and profilometer operates with precision of about 1mm at ranges of up to 100m. With scanning optics, device could track objects or accurately measure shapes of objects in field of view. New microprocessor-controlled design uses variable-length fiber-optic delay line as distance reference. New ranging method used in vision systems for industrial robots.

**B84-10279  
RAPID FREEZING-POINT MEASUREMENT**

B. MATHIPRAKASAM (Midwest Research Institute)

Apr. 1985 See Also CR-167981 (N83-10207)

**LEW-14019**

**Vol. 8, No. 4, P. 483**

Technique developed for rapid determination of freezing-point temperature of fuels. Technique determines freezing point in under 10 minutes and is suitable for use in design of portable device.

**B84-10280  
DETERMINING THE SLOPE ERROR OF A PARABOLIC REFLECTOR**

G. R. CHRIST (AAI Corporation)

Apr. 1985

**NPO-15713**

**Vol. 8, No. 4, P. 484**

Approximate slope error determined with minimal test equipment. Test Setup for Determining Slope Error for Point-Focusing Dish includes pinhole camera at center of curvature and color-coded target mounted around pinhole. Floodlights illuminate target to minimize exposure time. New procedure provides good approximation of reflector slope error and is excellent tool for comparative analysis of reflectors used as solar collectors for microwave receivers.

**B84-10281  
INTERFEROMETER FOR MEASURING ACOUSTIC SIGNALS**

R. O. CLAUS (Virginia Polytechnic Institute and State University) and A. O. GARG (Virginia Polytechnic Institute and State University)

Apr. 1985

### 03 PHYSICAL SCIENCES

**LAR-13030**

**Vol. 8, No. 4, P. 484**

Optical-fiber interferometer measures wave amplitude without contacting specimen surface. System contains remote detector head. Head includes beam splitter that divides input beam and recombines output beams, while spatial filter filters interference pattern at beam-splitter output; and lens focuses this on detector. Beams focused on specimen surface to record acoustic signals.

**B84-10282**

**ROOF OVERHANGS FOR SOLAR HOUSES**

W. GRACEY

Apr. 1985

**LAR-13140**

**Vol. 8, No. 4, P. 485**

Convenient graphical method determines both width and vertical position of overhangs for standard wall section having 'typical' window arrangement. Overhangs for this wall section determined for two extremes of latitude in United States.

**B84-10283**

**TELESCOPING SHIELD FOR POINT-FOCUSING SOLAR CONCENTRATORS**

M. ARGOUD (CALTECH), W. WALKER (CALTECH), and L. V. BUTLER (CALTECH)

Apr. 1985

**NPO-16236**

**Vol. 8, No. 4, P. 486**

Telescoping shield normally stowed around solar receiver protects heat engine and supporting structure from overheating when concentrator aimed few degrees away from line to Sun. When extended, shield intercepts off center concentrated solar radiation. Heat spread out over thermally conductive shield and reradiated diffusely not to cause structural damage.

**B84-10284**

**MAXIMUM OUTPUTS OF SOLAR PHOTOVOLTAIC ARRAYS**

R. G. ROSS JR. (CALTECH), G. M. HILL (CALTECH), and C. C. GONZALEZ (CALTECH)

1985

**NPO-15966**

**Vol. 8, No. 4, P. 487**

Report presents electrical data for solar photovoltaic arrays operating at different locations in United States. Data useful in designing power-conditioners for matching output of array to load.

**B84-10285**

**LASER POLLUTANT-MEASURING SYSTEMS**

W. B. GRANT (CALTECH) and R. T. MENZIES (CALTECH)

Apr. 1985

**NPO-16101**

**Vol. 8, No. 4, P. 487**

Laser optical system for remote gas pollutant measurements surveyed. Laser systems discussed in published report, and choices of appropriate gas measuring instruments and their sensitivities evaluated.

**B84-10286**

**RETRIEVAL OF GEOPHYSICAL PARAMETERS FROM RADIOMETRIC DATA**

P. C. PANDEY (CALTECH) and R. K. KAKAR (CALTECH)

Apr. 1985

**NPO-16266**

**Vol. 8, No. 4, P. 487**

Rapid linear algorithm retrieves meteorological parameters from microwave radiometric data. Versatile 2-step, multiple-linear-regression algorithm examines all possible subsets of available channels and selects optimum subset for retrieving given geophysical or meteorological parameter.

**B84-10287**

**INSTRUMENTATION FOR SOLAR-OSCILLATION MEASUREMENTS**

E. J. RHODES JR. (CALTECH), T. W. ANDREWS (CALTECH), E. J. SMITH (CALTECH), R. F. HOWARD (Mount Wilson Observatory), and R. K. ULRICH (UCLA)

Apr. 1985

**NPO-15687**

**Vol. 8, No. 4, P. 488**

System works with any telescope with spectrograph without interfering with existing use of spectrograph. Telescope aiming accuracy is 1 arc-second.

**B84-10288**

**SOLAR-POWER SYSTEM PRODUCES HIGH-PRESSURE STEAM**

F. L. LANSING (CALTECH)

Apr. 1985

**NPO-15434**

**Vol. 8, No. 4, P. 488**

Combination of three multistaged solar collectors produces highpressure steam for large-scale continuously operating turbines for generating mechanical or electrical energy. Superheated water vapor drives turbines, attaining an overall system efficiency about 22 percent.

**B84-10289**

**FRESNEL-LENS/HEAT-STORAGE SYSTEM**

R. H. TURNER (CALTECH)

Apr. 1985

**NPO-16242**

**Vol. 8, No. 4, P. 488**

Self-contained solar-thermal power-plant uses Fresnel lenses to deliver up to 100 kilowatts. Proposed 200-volt system uses about 800 Fresnel lenses.

**B84-10290**

**TEN THOUSAND SOLAR CONSTANTS RADIOMETER**

J. M. KENDALL SR. (CALTECH)

Apr. 1985

**NPO-15922**

**Vol. 8, No. 4, P. 488**

'Radiometer for Accurate (+ or - 1%) Measurement of Solar Irradiances Equal to 10,000 Solar Constants,' gives additional information on radiometer described elsewhere. Self-calibrating, water-cooled, thermopile radiometer measures irradiance produced in solar image formed by parabolic reflector or by multiple-mirror solar installation.

**B84-10291**

**HEAT STORAGE AND TRANSPORT**

P. A. BAHRAMI

Apr. 1985

**NPO-15468**

**Vol. 8, No. 4, P. 488**

System for storing large amounts of heat per unit volume comprises encapsulated sealed pellets of phase-change materials dispersed and suspended in inert fluid-transport medium.

**B84-10292**

**SOLAR SHUTTER**

R. R. HALE (CALTECH)

Apr. 1985

**NPO-15428**

**Vol. 8, No. 4, P. 489**

Solar receiver turned off by movable reflective shutter. When reflective surface interposed across optical axis, incoming solar heat reflected back to concentrator for rejection into space.

**B84-10293**

**SOLAR-HEATED GASIFIER**

S. A. QADER (CALTECH)

Apr. 1985

**NPO-15071**

**Vol. 8, No. 4, P. 488**

Catalytic coal and biomass gasifier system heated by solar energy. Sunlight from solar concentrator focused through quartz window onto ceramic-honeycomb absorber surface, which raises temperature of reactant steam, fluidizing gas, and reactor walls.

**B84-10294**

**POINT-FOCUSING SOLAR-POWER DISTRIBUTED RECEIVERS**

J. W. LUCAS (CALTECH)

Apr. 1985

**NPO-15578**

**Vol. 8, No. 4, P. 489**

Two-volume annual report describes development work

aimed at achieving large-scale production of modular, point-focusing distributed receivers (PFDR's) for solar-powered generation of electricity or thermal power for industrial use.

**B84-10295  
PURIFICATION OF SOLAR PONDS**

S. CARPENTER

Apr. 1985

**NPO-15397** Vol. 8, No. 4, P. 489

Flocculatory agents added to solar saltponds remove turbidity to increase solar-energy collection efficiency. Flocculating agent or bactericide used to remove microorganisms sprayed onto pond from airplane and allowed to settle to bottom of pond.

**B84-10296  
A CERAMIC HEAT EXCHANGER FOR SOLAR RECEIVERS**

C. ROBERTSON JR. (General Electric Co.) and L. STACY (General Electric Co.)

Apr. 1985

**NPO-15771** Vol. 8, No. 4, P. 489

Design intended for high-temperature service. Proposed ceramic-tube and header heat exchangers used for solar-concentrating collector operating in 25- to 150-KW power range at temperatures between 2,000 degrees and 3,000 degrees F (1,095 degrees and 1,650 degrees C).

**B84-10297  
CALIBRATING FOR IONOSPHERIC PHASE DELAYS**

P. F. MACDORAN (CALTECH)

Apr. 1985

**NPO-15430** Vol. 8, No. 4, P. 489

Technique determines ionospheric phase delay on real-time universally applicable basis in terms of electrons per meter squared by coherently modulating two L-band carrier frequencies received from two Global Positioning System satellites. Two pseudorandom number sequences cross-correlated to derive delay time.

**B84-10298  
GENERAL DESIGN CONSIDERATIONS FOR REMOTE SENSORS**

F. C. BILLINGSLEY (CALTECH)

Apr. 1985

**NPO-15930** Vol. 8, No. 4, P. 490

Report discusses design of orbiting remote sensors. Needs of users considered in light of satellite capabilities. Multiple-resolution sensor satisfies several disciplines otherwise competing for spatial and spectral resolution.

**B84-10299  
ELECTRON-ATTACHMENT PROFILES**

A. CHUTJIAN and J. M. AJELLO

Apr. 1985

**NPO-14865** Vol. 8, No. 4, P. 490

Report available that describes technique of photoelectron spectroscopy to measure shapes of threshold electron-attachment cross sections of various gases.

**B84-10300  
COMPOSITE SPECTROMETER PRISMS**

J. B. BRECKINRIDGE (CALTECH), N. A. PAGE (CALTECH), and J. M. RODGERS (University of Arizona)

Apr. 1985

**NPO-16060** Vol. 8, No. 4, P. 490

Efficient linear dispersive element for spectrometer instruments achieved using several different glasses in multiple-element prism. Good results obtained in both two- and three-element prisms using variety of different glass materials.

**B84-10301  
THERMAL COMPENSATOR FOR PARABOLOIDAL REFLECTOR**

C. G. STANICH (Daedalus Enterprises, Inc.) and F. G. OSTERWISCH (Daedalus Enterprises, Inc.)

Apr. 1985

**NPO-16145** Vol. 8, No. 4, P. 490

Mounting structure holds off-axis paraboloidal collimating mirror so that optical axis constantly focused and remains stationary with respect to fixed point over wide temperature range.

**B84-10302  
PARABOLOIDAL-DISH POWER MODULES**

W. R. REVERE (CALTECH), J. M. BOWYER (CALTECH), T. FUJITA (CALTECH), and H. I. AWAYA (CALTECH)

Apr. 1985

**NPO-16100** Vol. 8, No. 4, P. 490

Study determines configurational tradeoffs for particular paraboloidal-dish power system for isolated-load applications. Continuous level of power supplied with high reliability by using power system with modular paraboloidal-dish power units.

## 04 MATERIALS

**B84-10074  
UPGRADING METALLURGICAL-GRADE SILICON**

L. M. WOERNER (J.C. Schumacher Co.) and E. B. MOORE (J.C. Schumacher Co.)

Jan. 1985

**NPO-15076** Vol. 8, No. 3, P. 353

Closed-loop process produces semiconductor-grade silicon. Metallurgical-grade silicon converted to ultrapure silicon by reacting with hydrogen and silicon tetrahalide to form trihalosilane, purifying this intermediate and again decomposing to high purity silicon in third stage. Heterogeneously and homogeneously nucleated polycrystalline silicon used in semiconductor device applications and in silicon photovoltaic solar cell fabrication.

**B84-10075  
CONTAINERLESS MANUFACTURE OF GLASS OPTICAL FIBERS**

R. J. NAUMANN and E. C. ETHRIDGE

Jan. 1985

**MFS-25905** Vol. 8, No. 3, P. 354

Contamination and crystallization reduced in proposed process. Solid optical fiber drawn from an acoustically levitated lump of molten glass. New material added in solid form, melted and then moved into main body of molten glass. Single axis acoustic levitation furnances levitate glass melts at temperature up to about 700 degrees C. Processing in unit limited to low-melting temperature glasses.

**B84-10076  
EQUATION FOR ELECTROLYTE VISCOSITY**

R. F. FEDORS (CALTECH)

Jan. 1985

**NPO-15096** Vol. 8, No. 3, P. 355

Equation agrees with measurements over wide concentration range. Plot of calculated values from equation and measured values show close match except at extremely low concentrations of electrolyte. Other equations do not match data as well and limited to dilute solutions.

**B84-10077  
PRESSURE-LETDOWN PLATES FOR COAL GASIFIERS**

E. R. COLLINS JR. (CALTECH)

Jan. 1985

**NPO-15965** Vol. 8, No. 3, P. 355

## 04 MATERIALS

Variation of pseudoporous plates used with coal gasifiers in pressure letdown stage of processing minimize clogging. Rotating plates containing variable gap annuli continually change flow path to enable erosionless reduction of gas pressure. Particles that otherwise clog porous plugs pass through gaps.

**B84-10078**

### TESTING CERAMICS FOR DIESEL ENGINES

H. W. SCHNEIDER (CALTECH)

Jan. 1985

**NPO-15824**

**Vol. 8, No. 3, P. 356**

Adaptation of diesel engine allows prestressed ceramic materials evaluated under realistic pressure, temperature, and stress without introducing extraneous stress. Ceramic specimen part of prechamber of research engine. Specimen held in place by clamp, introduces required axial compressive stress. Specimen -- cylindrical shell -- surrounded by chamber vented or pressurized to introduce requisite radial stress in ceramic. Pressure chamber also serves as safety shield in case specimen disintegrates. Materials under consideration as cylinder liners for diesel engines.

**B84-10079**

### PURE GLASSES FROM MULTICOMPONENT GELS

S. P. MUKHERJEE (Battelle Columbus Laboratories)

Jan. 1985

**NPO-16160**

**Vol. 8, No. 3, P. 357**

Report describes experiments with multicomponent gels for preparation of pure glass. Experiments aimed at developing zero-gravitation process for fabrication of low-loss optical fibers.

**B84-10080**

### VACUUM BAKING TO REMOVE VOLATILE MATERIALS

J. A. MUSCARI (Martin Marietta Corp.)

Jan. 1985

**NPO-15648**

**Vol. 8, No. 3, P. 357**

Outgassing reduced in some but not all nonmetallic materials. Eleven polymeric materials tested by determining outgassing species as temperature of conditioned and unconditioned materials raised to 300 degrees C. Conditioning process consisted of vacuum bake for 24 hours at 80 degrees C in addition to usual cure. Baking did not change residual gas percentage of water molecules.

**B84-10081**

### SOLUTION POTENTIALS INDICATE ALUMINUM-ALLOY TEMPER

M. D. DANFORD

Jan. 1985 See Also NASA TM-82459 (N82-22345)

**MFS-25846**

**Vol. 8, No. 3, P. 357**

Report discusses use of solution potential as measure of temper of aluminum alloys. Technique based on fact that different tempers or heat treatments exhibit different solution potentials as function of aging time.

**B84-10082**

### PROPERTIES OF LOW-EXPANSION LAMINATES

M. KURAL (Lockheed Missiles & Space Company, Inc.)

Jan. 1985

**MFS-25859**

**Vol. 8, No. 3, P. 358**

Laminate elastic constants and coefficients of thermal expansion calculated for near-zero-expansion graphite/aluminum and graphite/magnesium composites. Report presents results in graphic form for these properties as function of laminate angle and fiber volume fraction for four high-modulus continuous-pitch fiber.

**B84-10083**

### ELASTOMER ENCAPSULANT FOR SOLAR-CELL ARRAYS

B. BAUM (Springborn Laboratories, Inc.) and P. B. WILLIS (Springborn Laboratories, Inc.)

Jan. 1985

**NPO-15663**

**Vol. 8, No. 3, P. 358**

Butyl acrylate syrups useful potting compounds for encapsulating photovoltaic cells in modular arrays. Material pourable liquid pumped into module, then cured to rubbery consistency. Cured material is thermoset elastomer highly transparent, low cost, flexible and with good low-temperature properties.

**B84-10084**

### EUTECTIC-ALLOY MORPHOLOGY

R. G. PIRICH (Grumman Aerospace Corp.) and W. J. POIT (Grumman Aerospace Corp.)

Jan. 1985

**MFS-25937**

**Vol. 8, No. 3, P. 358**

Deviation in controlled-rod eutectic morphology anticipated for diffusion only crystal growth characterized at low solidification velocities. Naturally induced, gravity-related convective instabilities result in nonaligned irregularly dispersed fibers or platelets. Lower solidification limit for controlled growth Bi/Mn alloys is 1 centimeter/hour.

**B84-10085**

### RELIABILITY STUDIES FOR FATIGUE-CRACK DETECTION

B. K. CHRISTNER (Martin Marietta Corp.), W. D. RUMMEL (Martin Marietta Corp.), and J. KNADLER (Martin Marietta Corp.)

Jan. 1985

**MFS-27031**

**Vol. 8, No. 3, P. 358**

Reusable test panels available to assess reliability of techniques that use fluorescent penetrant to detect fatigue cracks. Ultrasonic cleaning method developed for removing penetrant from panels prior to reuse.

**B84-10086**

### MAKING PURE FINE-GRAINED INORGANIC POWDER

C. WOOD (CALTECH)

Jan. 1985

**NPO-16398**

**Vol. 8, No. 3, P. 358**

Sustained arc plasma chemical reactor fabricates very-fine-grained inorganic solids having low thermal conductivity. Powder fabrication method, based on plasma tube technique produces pure solids without contamination commonly produced by grinding.

**B84-10087**

### FLUIDIZED-BED REACTOR SYSTEM

A. D. MORRISON (CALTECH)

Jan. 1985

**NPO-15975**

**Vol. 8, No. 3, P. 359**

Gas pyrolysis in hot fluidized beds minimized by use of selectively filtered radiation and parabolic cavity. Reactor is parabolic cavity of two or more axes in which light emanating from one axis bounces off walls of cavity and passes through object axis to heat sample.

**B84-10088**

### SAMARIUM/COBALT MAGNETS

D. DAS (Charles Stark Draper Laboratories, Inc.), K. KUMAR (Charles Stark Draper Laboratories, Inc.), R. FROST (Charles Stark Draper Laboratories, Inc.), and C. CHANG (Charles Stark Draper Laboratories, Inc.)

Jan. 1985

**MFS-27006**

**Vol. 8, No. 3, P. 359**

Intrinsic magnetic coercivities of samarium cobalt magnets made to approach theoretical limit of 350 kA/m by carefully eliminating oxygen from finished magnet by hot isostatic pressing (HIP). HIP process viable alternative to currently used sintering process.

**B84-10089**

### REDUCING LIQUID PERMEATION THROUGH POLYMER SHEETS

R. F. FEDORS (CALTECH)

Jan. 1985

**NPO-15802**

**Vol. 8, No. 3, P. 359**

Permeation of liquid through polymer sheets retarded by including in polymer solute for excluded liquid. Long-term or steady state permeability not reduced by solute inclusions.

**B84-10090**  
**COAL-FACE FRACTURE WITH A TWO-PHASE LIQUID**  
E. R. COLLINS JR. (CALTECH)  
Jan. 1985  
**NPO-15849** Vol. 8, No. 3, P. 359

In new method for mining coal without explosive, two-phase liquid such as CO<sub>2</sub> and water, injected at high pressure into deeper ends of holes drilled in coal face. Liquid permeates coal seam through existing microfractures; as liquid seeps back toward face, pressure eventually drops below critical value at which dissolved gas flashvaporizes, breaking up coal.

**B84-10091**  
**POLYURETHANE-FOAM MASKANT**  
R. BODEMEIJER (Rockwell International Corp.)  
Jan. 1985  
**MFS-19786** Vol. 8, No. 3, P. 359

Brown wax previously used to mask hardware replaced with polyurethane foam in electroplating and electroforming operations. Foam easier to apply and remove than wax and does not contaminate electrolytes.

**B84-10092**  
**STREAMING-POTENTIAL STUDIES**  
D. GREGONIS (University of Utah), R. VAN WAGENEN (University of Utah), S. MA (University of Utah), and J. ANDRADE (University of Utah)  
Jan. 1985  
**MFS-25657** Vol. 8, No. 3, P. 359

Apparatus and experimental technique based on measurements of streaming potentials evaluates effects of surface coatings for reducing or eliminating electro-osmotic flow.

**B84-10093**  
**MATHEMATICAL MODEL FOR GAS DISSOLUTION IN GLASS**  
M. C. WEINBERG (GTE), P. I. ORONATO (GTE), and D. R. UHLMANN (MIT)  
Jan. 1985  
**NPO-15104** Vol. 8, No. 3, P. 360

Mathematical model calculates rate of small oxygen-bubble contraction in soda/lime/silicate melts in presence of foreign nondiffusing gas. Process of interest in optical glass fabrication.

**B84-10303**  
**DESULFURIZATION OF COAL IN FLUIDIZED BEDS**  
R. MADDURY (CALTECH) and J. KALVINSKAS (CALTECH)  
Apr. 1985  
**NPO-15924** Vol. 8, No. 4, P. 493

Experimental dry chemical process for removing sulfur from coal-and thereby reducing harmful sulfur emissions from coal-fired electric powerplants-promises more economical and effective than older wet chemical processes. New process faster, requires smaller amounts of chemical reagents, and produces no liquid effluents, which poses disposal problem.

**B84-10304**  
**INCREASING THE DUCTILITY OF ELECTROPLATED METALS**  
N. PATON (Rockwell International Corp.) and C. RHODES (Rockwell International Corp.)  
Apr. 1985  
**MFS-19873** Vol. 8, No. 4, P. 494

Hot isostatic pressing effective in improving ductility of metal plating. Previously hot isostatic pressing used on powder-metallurgy parts and castings but not on electroplated parts. To test idea, copperplated heated to 800 degrees C at pressure of 23,000 psi (160 MN/m<sup>2</sup>) for 4 hours.

When part examined metallographically, completely free from porosity.

**B84-10305**  
**EUTECTIC CONTACT INKS FOR SOLAR CELLS**  
B. ROSS (Bernd Ross Associates)  
Apr. 1985  
**NPO-15171** Vol. 8, No. 4, P. 494

Low-resistance electrical contacts formed on solar cells by melting powders of eutectic composition of semiconductor and dopant. Process improves cell performance without subjecting cell to processing temperatures high enough to degrade other characteristics.

**B84-10306**  
**LIGHTWEIGHT HIGH-TEMPERATURE THERMAL INSULATION**  
W. R. WAGNER (Rockwell International Corp.) and J. I. FASHEH (Rockwell International Corp.)  
Apr. 1985  
**MFS-19754** Vol. 8, No. 4, P. 495

Fine Ni/Cr fibers sintered into corrosion-resistant, fireproof batt. Possible applications include stoves, furnaces, safes, fire clothing, draperies in public buildings, wall firebreaks, airplane walls, and jet engine components. New insulation takes advantage of some of same properties of nickel/chromium alloy useful in heating elements in toasters, namely, corrosion and oxidation resistance even at high temperatures.

**B84-10307**  
**INHIBITING WET OXIDATION OF AMMONIA**  
D. B. L. ONISKO (National Research Council)  
Apr. 1985  
**ARC-11407** Vol. 8, No. 4, P. 496

Simple modification of wet-oxidation process for treating organic waste reduces loss of fixed nitrogen, potentially valuable byproduct of process. Addition of sufficient sulfuric acid to maintain reaction pH below 3 greatly reduces oxidation of ammonia to free nitrogen. No equipment modification required.

**B84-10308**  
**APPLYING UNIFORM POLYMER COATINGS TO MICROSOPHERES**  
M. C. LEE (CALTECH)  
Apr. 1985  
**NPO-16075** Vol. 8, No. 4, P. 496

Acoustic levitation yields even coating on glass microspheres. Automatic Coating Apparatus injects polymer into acoustic levitator, moves glass sphere into polymer, dries polymer, and removes coated sphere. Apparatus injects more polymer for coating another sphere, and cycle repeats.

**B84-10309**  
**DEFECT CHEMISTRY OF HG1-XCDXTE**  
H. VYDYANATH (Honeywell, Inc.), D. NELSON (Honeywell, Inc.), J. DONOVAN (Honeywell, Inc.), P. CRICKARD (Honeywell, Inc.), A. BARNES (Honeywell, Inc.), R. ABBOTT (Honeywell, Inc.), and R. LANCASTER (Honeywell, Inc.)  
Apr. 1985  
**MFS-25851** Vol. 8, No. 4, P. 497

Intermediate goal of this investigation to correlate nature and concentration of lattice defects with physicochemical conditions of preparation; namely, temperature, partial pressures of constituent elements and/or dopant concentration. Result of this investigation: possible to predict and control nature and concentration of defects as function of preparation conditions.

**B84-10310**  
**LOW-TEMPERATURE EXTRACTION OF OIL FROM SHALE**  
L. E. COMPTON (CALTECH)  
Apr. 1985  
**NPO-15656** Vol. 8, No. 4, P. 498

## 04 MATERIALS

Technique increases recovery and energy efficiency. Advantages of method greater product yield and, because of the relatively low temperatures, minimal gas formation, smaller amounts of char byproduct, and less carbonate-rock decomposition. Up to 94 percent by weight of organic material in shale extracted.

**B84-10311**

### HIGH-TEMPERATURE COATING FOR TITANIUM

R. J. MELL (IIT Research Institute) and Y. HARADA (IIT Research Institute)  
Apr. 1985

**NPO-16222**

**Vol. 8, No. 4, P. 498**

Wet coating mixture composed of graphite pigment potassium silicate binder solution and distilled water. Resulting coating has electrical resistivity of less than 10 to the 6th power ohm-cm.

**B84-10312**

### PREDICTING POLYMER/LIQUIDE INTERACTIONS

R. F. FEDORS (CALTECH)

Apr. 1985

**NPO-14874**

**Vol. 8, No. 4, P. 498**

Calculations of liquid absorption by rubber vulcanizates agree with experimental results. Equation allows calculation of swelling of rubber vulcanizates by liquids, based on knowledge of chemical structure of polymer and solvent. Calculated values agree favorably with experimental data.

**B84-10313**

### SILICON FORMATION FOR SOLAR CELLS

K. SANCIER (SRI International)

Apr. 1985

**NPO-14973**

**Vol. 8, No. 4, P. 498**

Highly pure silicon obtained for solar cells by proposed technique that sprays liquid-sodium droplets into SiF<sub>4</sub> gas. Resulting freely flowing powder of silicon and sodium fluoride will not adhere to reactor walls and easily transferred to melt separator to recover silicon.

**B84-10314**

### INTEGRATED FUEL CELL/COAL GASIFIER

J. F. FERRALL (CALTECH)

Apr. 1985

**NPO-16062**

**Vol. 8, No. 4, P. 498**

Powerplant design with low-temperature coal gasifier coupled to highly-exothermic fuel cell for efficient production of dc power eliminates need for oxygen in gasifier and achieves high fuel efficiency with recycling of waste heat from fuel cell.

**B84-10315**

### ELASTOMERIC CATHODE BINDER

S. P. S. YEN (CALTECH), D. S. SHEN (CALTECH), and R. B. SOMOANO (CALTECH)

Apr. 1985

**NPO-15424**

**Vol. 8, No. 4, P. 499**

Soluble copolymer binder mixed with cathode material and solvent forms flexible porous cathode used in lithium and Ni/Cd batteries. Cathodes prepared by this process have lower density due to expanding rubbery binder and greater flexibility than conventional cathodes. Fabrication procedure readily adaptable to scaled-up processes.

**B84-10316**

### ACTIVATED INTERNAL GETTERING

J. K. LIU (CALTECH), G. H. SCHWUTKE, and K. M. KOLIWAD

Apr. 1985

**NPO-15530**

**Vol. 8, No. 4, P. 499**

Lifetimes of minority carriers in silicon webs improved by annealing. Heat treatment of silicon web ribbons considerably improves efficiency of solar cells.

**B84-10317**

### PREPARING INSB SUBSTRATES

R. P. VASQUEZ (CALTECH), B. F. LEWIS (CALTECH), and F. J. GRUNTHANER (CALTECH)

Apr. 1985

**NPO-16127**

**Vol. 8, No. 4, P. 499**

Molecular-beam epitaxial substrates passivated by chloride film growth. Chloride layer produced by direct chlorination, by chloride radicals in solutions, or by formation of preliminary oxide layer followed by chloride substitution.

**B84-10318**

### CLEANING THE WALLS OF A SILANE REACTOR

K. A. YAMAKAWA (CALTECH)

Apr. 1985

**NPO-15851**

**Vol. 8, No. 4, P. 499**

Scraper removes silicon deposits from inner walls of reactor vessel. Scraper supported by gas bearing. Scraper made of non-contaminating material such as quartz or silicon.

**B84-10319**

### STABILIZED ALUMINUM TITANATE

J. E. SCHROEDER (CALTECH)

Apr. 1985

**NPO-16227**

**Vol. 8, No. 4, P. 499**

Stable, potentially-inexpensive, cubic crystalline alpha aluminum titanate that shows no phase change to 1,700 K used in heat exchangers. Particular stabilizing species must be selected with careful attention to crystal dimensions and bond angles of alpha and beta phases of aluminum titanate.

**B84-10320**

### MOLTEN-SALT ELECTROLYSIS

D. CUBICCIOTTI (SRI International)

Apr. 1985

**NPO-15535**

**Vol. 8, No. 4, P. 499**

Concept of electrolytic decomposition of gaseous hydrogen sulfide to yield gaseous sulfur at anode and hydrogen gas at cathode considered.

## 05 LIFE SCIENCES

**B84-10094**

### TRANSDUCERS FOR HEAT RESEARCH

C. FELDSTEIN (CALTECH), S. MEERBAUM (CALTECH), G. W. LEWIS (CALTECH), and V. H. CULLER (CALTECH)

Jan. 1985

**NPO-15095**

**Vol. 8, No. 3, P. 363**

Series of transducers with seven different configurations enable measurement of forces and displacements in heart wall. New transducers small, cause minimal perturbation of heart function and attached and detached without causing excessive tissue damage. All units implanted or removed during single heartbeat, permitting rapid relocation for detail mapping.

**B84-10095**

### AQUATIC PLANTS AID SEWAGE FILTER

B. C. WOLVERTON

Jan. 1985

**MFS-25808**

**Vol. 8, No. 3, P. 364**

Method of wastewater treatment combines micro-organisms and aquatic plant roots in filter bed. Treatment occurs as liquid flows up through system. Micro-organisms, attached themselves to rocky base material of filter, act in several steps to decompose organic matter in wastewater. Vascular aquatic plants (typically, reeds, rushes, cattails, or water hyacinths) absorb nitrogen, phosphorus, other nu-



trients, and heavy metals from water through finely divided roots

**B84-10096**  
**MONITORING MARINE MICROBIAL FOULING**  
R. COLWELL (University of Maryland)

Jan. 1985

**MFS-25928**

**Vol. 8, No. 3, P. 364**

Two techniques developed for studying marine fouling. Methods originally developed to study fouling of materials used in Space Shuttle solid fuel booster rockets. Methods used to determine both relative fouling rates and efficacy of cleaning methods to remove fouling on various surfaces including paints, metals, and sealants intended for marine use.

**B84-10097**  
**EXPERIMENTAL ECOSYSTEMS SEALED IN GLASS**  
J. A. HANSON (CALTECH)

Jan. 1985

**NPO-15712**

**Vol. 8, No. 3, P. 365**

Report describes investigation of dynamics of microbial ecosystems sealed in 1-liter flasks and exposed to Sunlight or artificial light for extended periods. Many organisms survived more than 15 years. Such systems have primary productivity and quantum efficiencies comparable to estimates for Earth's ecosystems.

**B84-10098**  
**ESTIMATING HEALTH SERVICES REQUIREMENTS**  
H. M. ALEXANDER (CALTECH)

Jan. 1985

**NPO-14151**

**Vol. 8, No. 3, P. 366**

In computer program NOROCA populations statistics from National Center for Health Statistics used with computational procedure to estimate health service utilization rates, physician demands (by specialty) and hospital bed demands (by type of service). Computational procedure applicable to health service area of any size and even used to estimate statewide demands for health services.

**B84-10099**  
**PARAMETERS AFFECTING ELECTROPHORESIS**  
J. VANDERHOFF (Lehigh University) and F. MICALÉ (Lehigh University)

Jan. 1985

**MFS-25593**

**Vol. 8, No. 3, P. 366**

Experimental approaches and problems facing successful continuous particle separation by electrophoresis outlined in short report. Influence of particle size, concentration, and charge discussed.

**B84-10100**  
**DIALYSIS EXTRACTION FOR CHROMATOGRAPHY**  
V. J. JAHNSSEN (CALTECH)

Jan. 1985

**NPO-15691**

**Vol. 8, No. 3, P. 366**

Chromatographic-sample pretreatment by dialysis detects traces of organic contaminants in water samples analyzed in field with minimal analysis equipment and minimal quantities of solvent. Technique also of value wherever aqueous sample and solvent must not make direct contact.

**B84-10321**  
**PROBE FOLLOWER FOR MOVING BLOOD VESSELS**  
R. E. FRAZER (CALTECH) and T. W. ANDREWS (CALTECH)

Apr. 1985

**NPO-15898**

**Vol. 8, No. 4, P. 503**

Probes track vessel expansion and contraction with minimal perturbation. Nozzle back-pressure changes at cuff on blood vessel basis for monitoring position of probe in blood vessel. Fluidic amplifiers use signals to control three-axis servo that centers measuring probe between sensing-nozzle pairs at cuff.

**B84-10322**  
**PHOTOGRAPHIC SCREENING FOR EYE DEFECTS**  
J. RICHARDSON

Apr. 1985 See Also NASA TM-82359 (N83-34565/NSP)

**MFS-27045**

**Vol. 8, No. 4, P. 504**

Images of retinas examined for characteristic patterns. Color photographs of retinas taken. Proper alignment of eye obtained by asking subject to gaze at light-emitting diode. 'Red-eye' patterns in resulting color photographs examined by trained observers for signs of ocular defects. System used to check power of contact lenses and eyeglasses by taking photographs with these items in place.

## 06 MECHANICS

**B84-10101**  
**TEMPERATURE-GRADIENT FURNACE FOR SOLIDIFICATION EXPERIMENTS**  
B. R. ALDRICH and W. D. WHITT

Jan. 1985

**MFS-25963**

**Vol. 8, No. 3, P. 369**

Gradients are controllable from zero to 500 degrees C/cm. Typical temperature profile superimposed on partial cross section of furnace. Steepness of gradient varied by adjusting flow of energy to and from different zones of furnace. Specimen placed in ampoule moved inside ceramic tube according to needs of experiment. Furnace provides axial temperature profiles for material processing experiments.

**B84-10102**  
**IMPROVED ELLIPSOIDAL RADIATION FURNACE**  
E. C. ETHRIDGE

Jan. 1985

**MFS-25933**

**Vol. 8, No. 3, P. 370**

Spherical reflector around heat source increases efficiency and minimizes power requirements. Furnace consists of ellipsoid with point heat source, at one focus and sample heated at other focus. Spherical reflector with circular slit surrounds heat source. All radiation not passing through circular slit in spherical reflector reflected back to lamp. Radiation passing through spherical slit focused by ellipsoid surface onto sample. Arrangement uses heat efficiently, reduces waste heat generation and permits full view of specimen.

**B84-10103**  
**DOUBLE LINEAR DAMAGE RULE FOR FATIGUE ANALYSIS**  
G. HALFORD and S. MANSON (Case Western Reserve University)

Feb. 1985 See Also NASA TM-81517 (N80-23684/NSP)

**LEW-14058**

**Vol. 8, No. 3, P. 371**

Double Linear Damage Rule (DLDR) method for use by structural designers to determine fatigue-crack-initiation life when structure subjected to unsteady, variable-amplitude cyclic loadings. Method calculates in advance of service how many loading cycles imposed on structural component before macroscopic crack initiates. Approach eventually used in design of high performance systems and incorporated into design handbooks and codes.

**B84-10104**  
**EDDY-CURRENT INSPECTION OF BALL BEARINGS**  
B. BANKSTON

Jan. 1985

**MFS-25833**

**Vol. 8, No. 3, P. 371**

Custom eddy-current probe locates surface anomalies.

## 06 MECHANICS

Low friction air cushion within cone allows ball to roll easily. Eddy current probe reliably detects surface and near-surface cracks, voids, and material anomalies in bearing balls or other spherical objects. Defects in ball surface detected by probe displayed on CRT and recorded on strip-chart recorder.

**B84-10105**

### **SURFACE-STREAMLINE FLOW VISUALIZATION**

L. LANGSTON (University of Connecticut) and M. BOYLE (University of Connecticut)  
Jan. 1985

**LEW-13875**

**Vol. 8, No. 3, P. 372**

Matrix of ink dots covers matte surface of polyester drafting film. Film placed against wind-tunnel wall. Layer of methyl salicylate (oil of wintergreen) sprayed over dotted area. Ink dot streaklines show several characteristics of flow, including primary saddle point of separations, primary horseshoe vortex and smaller vortex at cylinder/endwall junction. Surface streamline flow visualization technique suitable for use in low-speed windtunnels or other low-speed gas flows.

**B84-10106**

### **STRUCTURAL TURNBUCKLE BEARS COMPRESSIVE OR TENSILE LOADS**

W. A. BATEMAN (Rockwell International Corp.) and C. H. LANG (Rockwell International Corp.)  
Jan. 1985

**MFS-25939**

**Vol. 8, No. 3, P. 373**

Column length adjuster based on turnbuckle principle. Device consists of internally and externally threaded bushing, threaded housing and threaded rod. Housing attached to one part and threaded rod attached to other part of structure. Turning double threaded bushing contracts or extends rod in relation to housing. Once adjusted, bushing secured with jamnuts. Device used for axially loaded members requiring length adjustment during installation.

**B84-10107**

### **BEAM WINDOW FOR PRESSURE CHAMBERS**

J. W. BRANSFORD (National Bureau of Standards) and J. G. AUSTIN JR. (National Bureau of Standards)  
Jan. 1985

**MFS-25961**

**Vol. 8, No. 3, P. 374**

Window resists products of combustion experiments. Sodium chloride window seals over chamber pressures from 0.1 to 13.8 MPa while absorbing minimal energy from CO<sub>2</sub> laser beam that passes through it into chamber. Window inexpensive and easily replaceable.

**B84-10108**

### **FABRICATING THIN-SHELL HEAT-TRANSFER MODELS**

D. E. AVERY, G. K. BALLARD, M. L. WILSON, and J. H. ALLEN SR. (Johnson Space Center)  
Jan. 1985

**LAR-13087**

**Vol. 8, No. 3, P. 375**

Freestanding shells produced for experimental aerodynamic-heating tests. Heat transfer shells require several steps and several precise molds. First, interlocking aluminum male and female molds fabricated. Holes for thermocouples drilled through male mold at desired locations. Wires having same diameter as thermocouple wire placed through holes in male mold flush to female mold. Epoxy exposed to vacuum to remove air bubbles poured between male and female molds to form thin female mold. Once mold cured, wires removed and aluminum molds separated.

**B84-10109**

### **FLEXIBLE HEAT PIPE**

W. B. BIENERT (Dynatherm Corp.) and D. A. WOLF (Dynatherm Corp.)  
Jan. 1985

**GSC-12864**

**Vol. 8, No. 3, P. 376**

Narrow Tube carries 10 watts or more to moving parts. Heat pipe 12 inches long and diameter of 0.312 inch

(7.92mm). Bent to minimum radius of 2.5 blocks. Flexible section made of 321 stainless steel tubing (Cajon Flexible Tubing or equivalent). Evaporator and condenser made of oxygen free copper. Working fluid methanol.

**B84-10110**

### **UNIFORM-TEMPERATURE WALLS FOR CLOUD CHAMBERS**

G. FLEISCHMAN (Hughes Aircraft Co.)

Jan. 1985

**MFS-25931**

**Vol. 8, No. 3, P. 376**

Flat heat pipes rapidly transfer heat to and from experimental volumes. Heat pipe vapor chamber carries heat to and from thermo electric modules. Critical surface acts as evaporator or condenser in cloud physics experiments. Used as walls of spaceborne atmospheric cloud chambers. On Earth, used as isothermal floors for environmental test chambers.

**B84-10111**

### **ENERGY-ABSORBING AIRFRAMES FOR GENERAL AVIATION**

H. D. CARDEN, R. J. HAYDUK, J. CRONKHITE (Helicopter Textron, Inc.), and V. BERRY (Helicopter Textron, Inc.)  
Jan. 1985 See Also NASA CR-3603 (N82-33735/NSP)

**LAR-12808**

**Vol. 8, No. 3, P. 377**

Concept for protecting people in lightweight airplane crashes involves redesigning area between interior floor and outer skin of airplane belly to create subfloor strong enough to bear stresses of flight but crush under force of impact. Several concepts evaluated and five selected and designed as lower fuselage sections tested in NASA's crash-testing program. Notched corner concept, Corrugated Beam concept, Foam-Filled Cylinder concept, Corrugated Half Shell concept, and Canted Bulkhead concept. Experimental and analytical results indicate all five concepts perform well; upper floor remains structurally intact whereas crush zone collapses under essentially constant load.

**B84-10112**

### **INTERFEROMETER DETECTS ACOUSTIC EMISSIONS IN COMPOSITES**

J. H. CANTRELL JR., R. O. CLAUSE (Virginia Polytechnic Institute and State University), J. C. WADE (Virginia Polytechnic Institute and State University), and P. S. ZERWEKH (Virginia Polytechnic Institute and State University)  
Jan. 1985

**LAR-12965**

**Vol. 8, No. 3, P. 378**

Embedded single-mode optical fibers sample internal-stress fields directly. Statically loaded composite matrix emits pulsed ultrasonic waves which mechanically modulate embedded fiber and phase-modulate transmitted optical field. Modulation detected by optical interferometry and Fourier optical processing converted to electronic signal proportional to acoustic field amplitude integrated along length of fiber embedded in specimen. Technique used for measurements of both high- and low-frequency CW acoustic fields as well as high-frequency transients.

**B84-10113**

### **MEASURING ABSOLUTE OXYGEN PRESSURE**

R. RICHTER (CALTECH)

Jan. 1985

**NPO-16131**

**Vol. 8, No. 3, P. 379**

Sensor determines absolute pressure of oxygen without reference pressure source. Absolute oxygen pressure transducer with control circuit enables measurement without reference pressure. Transducer, two part device, combines solid electrolyte membranes sensor with diffusional orifice. Device adapted for direct control of oxygen pressure in combustion mixtures.

**B84-10114**

### **LOW-STRESS SEALING OF PRESSURE TRANSDUCERS**

R. E. KROY (Rockwell International Corp.)

Jan. 1985

**MFS-19877****Vol. 8, No. 3, P. 380**

Compliant washer seals high pressures without excessive compressive stress on transducer. Conformal washer serves as effective seal for transducer passing through walls of pressure vessel. Washer makes it unnecessary to tighten mounting nut to high torque, which could damage transducer or adversely affect accuracy. Washer also used to seal mountings for temperature sensors and other devices.

**B84-10115****PREVENTING FIRES IN CRYOGENIC OXIDIZER LINES**

W. R. WAGNER (Rockwell International Corp.)

Jan. 1985

**MFS-19830****Vol. 8, No. 3, P. 380**

Friction and compression induced ignition prevented by heat-dissipation layer. Thin layer of copper placed inside surfaces of pipes and other parts in contact with flowing liquid oxygen, fluorine, or other oxidizers. Copper layer of only 0.001 to 0.005 inch (0.0254 to 0.127 mm) ensures heat away from hotspots thereby discouraging ignition. Copper layer increases oxygen ignition threshold of pipe by 5 to 20 times.

**B84-10116****MEASURING RIND THICKNESS ON POLYURETHANE FOAM**

C. JOHNSON (Martin Marietta Corp.), J. MILLER (Martin Marietta Corp.), and H. BROWN (Martin Marietta Corp.)

Jan. 1985

**MFS-25941****Vol. 8, No. 3, P. 381**

Nondestructive test determines rind thickness of polyurethane foam. Surface hardness of foam measured by Shore durometer method: hardness on Shore D scale correlates well with rind thickness. Shore D hardness of 20, for example, indicates rind thickness of 0.04 inch (1 millimeter). New hardness test makes it easy to determine rind thickness of sample nondestructively and to adjust fabrication variables accordingly.

**B84-10117****REDUCING THERMAL EXPANSIVITY OF COMPOSITE PANELS**

D. D. SMITH (Boeing Aerospace Co.)

Jan. 1985

**MFS-25793****Vol. 8, No. 3, P. 382**

Coefficient of thermal expansion of laminated graphite/epoxy composite panels altered after panels cured by postcuring heat treatment. Postcure decreases coefficient of thermal expansion by increasing crosslinking between molecules. Treatment makes it possible to reprocess costly panels for requisite thermal expansivity instead of discarding them.

**B84-10118****SINTERED LINING FOR HEAT-PIPE EVAPORATOR**

D. M. ERNST (Thermacore, Inc.) and G. Y. EASTMAN (Thermacore, Inc.)

Jan. 1985

**NPO-16172****Vol. 8, No. 3, P. 382**

Hotspots eliminated by lining inner wall. Distribution of heat transfer liquid in heat-pipe evaporator improved by lining inner wall with layer of sintered metal. Sintered layer takes place of layer of screen wick formerly sintered or bonded to wall. Since sintered layer always full of liquid, no hotspot of type that previously arose where former screen wick did not fit properly against wall.

**B84-10119****JOINT FOR ERECTABLE AND COLLAPSIBLE FRAMES**

T. E. PELISCHEK

Jan. 1985

**MSC-20635****Vol. 8, No. 3, P. 383**

Joint mechanism allows truss structure to be folded and stowed in small space. Mechanism includes hinge attached to two truss elements connected by two links, tension bar, and compression bar. When folded elements

are released, springs in joint mechanism rotate truss elements about hinge and lock mechanism to form single member. Developed for structures erected in space (antennas, solar panels, solar sails, and masts), joint mechanism adaptable to window-opening struts, folding furniture and television antennas.

**B84-10120****LIGHTNING PROTECTION FOR COMPOSITE AIRCRAFT STRUCTURES**

G. O. OLSON (The Boeing Co.)

Jan. 1985

**LAR-12879****Vol. 8, No. 3, P. 384**

Lightning protection system consisting of two layers of aluminum foil separated by layer of dielectric material protects graphite/epoxy composite structures on aircraft. Protective layer is secondarily applied lightning protection system, prime advantage of which is nullification of thermal and right angle effect of lightning arc attachment to graphite/epoxy laminate.

**B84-10121****EFFICIENT JOINTS FOR GRAPHITE/EPOXY STRUCTURES**

D. E. SKOUMAL (Boeing Aerospace Co.) and J. B. CUSHMAN (Boeing Aerospace Co.)

Jan. 1985 See Also NASA CR-3602 (N83-16787 NSP)

**LAR-13091****Vol. 8, No. 3, P. 385**

Bonded joints perform well through wide temperature range. Tests indicate significant improvement in joint efficiencies available through geometric modifications and hybrid material additions at adherent interfaces. Material modifications consisted of placing S-glass polyimide fabric in joint between adherents. Most fabric interface specimens delaminated between two fabric plies as opposed to failing in base adherents.

**B84-10122****ACQUISITION OF DYNAMIC STRESS/STRAIN DATA**

R. G. MINES (Rockwell International Corp.) and R. J. DEMONET (Rockwell International Corp.)

Jan. 1985

**MSC-20589****Vol. 8, No. 3, P. 385**

Computer program enables real-time data acquisition and plotting of stress strain by small, desk top computer. Program monitors load cell and multiple-strain gages during tension or compression loading. Scan routine triggered by specified change of applied load or longitudinal strain.

**B84-10123****DYNAMIC SIMULATION AND STABILITY ANALYSIS**

H. P. FRISCH and J. A. SANBORN

Jan. 1985

**GSC-12810****Vol. 8, No. 3, P. 385**

Dynamic Interaction Simulation of Controls and Structure (DISCOS) program developed for dynamic simulation and stability analysis of passive and actively controlled spacecraft. In use of DISCOS, physical system undergoing analysis generally described as cluster of contiguous flexible structures (bodies) that comprise mechanical system, such as spacecraft.

**B84-10124****AERODYNAMIC ANALYSIS OF LOW-SPEED WING-FLAP SYSTEMS**

H. W. CARLSON (Kentron International, Inc.) and K. B. WALKLEY (Kentron International, Inc.)

Jan. 1985

**LAR-13116****Vol. 8, No. 3, P. 386**

SUBAERF program developed for aerodynamic analysis and design of lowspeed wing-flap systems. SUBAERF based on linearized theory lifting-surface solution. Low speed aerodynamic analysis method used in SUBAERF provides estimates of wing performance which include effects of attainable leading edge thrust and vortex lift.

B84-10125

**TURBINE-ENGINE TRANSIENT-ROTOR ANALYSIS**

V. GALLARDO JR. (General Electric Co.), M. STALLONE (General Electric Co.), A. STORACE (General Electric Co.), and G. BLACK (General Electric Co.)

Jan. 1985

LEW-13726

Vol. 8, No. 3, P. 386

Computer program developed to predict structural dynamics of rotor system in gas turbine engines subjected to sudden unbalance. TETRA computer code calculates transient structural response of turbine engines due to blade loss or other time-dependent events. Used on structures other than turbine engines with little or no modification.

B84-10126

**HEAT-EXCHANGER COMPUTATIONAL PROCEDURE FOR TEMPERATURE-DEPENDENT FOULING**

L. CHIAPPETTA (United Technologies Corp.) and E. SZETELA (United Technologies Corp.)

Jan. 1985

LEW-13874

Vol. 8, No. 3, P. 387

Computer program predicts heat-exchanger performance under variety of conditions. Program provides rapid means of calculating distribution of fluid and wall temperatures, fuel deposit formation, and pressure losses at various locations in heat exchanger. Developed for use with heat exchanger that vaporizes fuel prior to fuel ignition; other applications possible.

B84-10127

**STRUCTURAL ANALYSIS OF CYLINDRICAL THRUST CHAMBERS**

W. ARMSTRONG (Lockheed Missiles &amp; Space Co., Inc.) and M. PEARSON (Lockheed Missiles &amp; Space Co., Inc.)

Jan. 1985

LEW-13655

Vol. 8, No. 3, P. 387

System of three computer programs developed for use with BOPACE finite-element program for analyzing cumulative plastic deformation of structures subject to high thermomechanical load cycles.

B84-10128

**TURBULENT RECIRCULATING FLOWS IN ISOTHERMAL COMBUSTOR GEOMETRIES**

D. LILLEY (Oklahoma State University) and D. RHODE (Oklahoma State University)

Jan. 1985

LEW-13894

Vol. 8, No. 3, P. 387

Computer program developed that provides mathematical solution to design and construction of combustion chambers for jet engines. Improved results in areas of combustor flow fields accomplished by this computer-program solution, cheaper and quicker than experiments involving real systems for models.

B84-10129

**COMPUTATION OF THREE-DIMENSIONAL COMBUSTOR PERFORMANCE**

S. SRIVATSA (Garrett Turbine Engine Co.)

Jan. 1985

LEW-13930

Vol. 8, No. 3, P. 388

Existing steady-state 3-D computer program for calculating gasturbine flow fields modified to include computation of soot and nitrogen oxide emission. In addition, radiation calculation corrected for soot particles. These advanced tools offer potential of reducing design and development time required for gas-turbine combustors.

B84-10130

**GENERATING TABLES OF THERMODYNAMIC PROPERTIES**

S. N. NGUYEN (Rockwell International Corp.)

Jan. 1985

MSC-20701

Vol. 8, No. 3, P. 388

Thermodynamic Property Generation program produces tables for any fluid for which state equation, vapor pressure

equation, specific heat equation, and critical constants are known. Program calculates thermodynamic properties at any state providing way of obtaining properties at extreme environmental conditions.

B84-10131

**TRAJECTORY ANALYSIS AND THE ORBIT DETERMINATION**

D. J. ALDERSON (CALTECH), F. H. BRADY (CALTECH), P. J. BRECKHELMER (CALTECH), J. B. COLLIER (CALTECH), J. E. EKELUND (CALTECH), J. ELLIS (CALTECH), D. E. HILT (CALTECH), A. R. KHATIB (CALTECH), V. N. LEGERTON (CALTECH), S. K. MCMAHON (CALTECH) et al

Jan. 1985

NPO-15586

Vol. 8, No. 3, P. 388

Two programs aid in trajectory analysis. DPTRAJ, ODP and their supporting utility programs capable of handling massive amounts of data and performing numerical calculations required for solving navigation problems associated with planetary fly-by and lander missions. Used extensively in support of Voyager.

B84-10132

**ORBITAL MECHANICS ANALYSIS PROGRAM**

W. C. SIMON (Rockwell International Corp.), S. C. JAN-KOWSKI (Rockwell International Corp.), and T. B. HUGHES (Rockwell International Corp.)

Jan. 1985

MSC-20700

Vol. 8, No. 3, P. 389

Orbital Mechanics Analysis Program provides engineers with simple tool for analysis or synthesis of any orbital maneuvering function involving vehicle and target. Program useful in such applications as proximity operations and rendezvous maneuvers.

B84-10133

**THERMAL RADIATION ANALYZER**

R. A. VOGT, C. L. JENSEN (Martin Marietta Corp.), R. G. GOBLE (Martin Marietta Corp.), and R. J. CONNER (Martin Marietta Corp.)

Jan. 1985

MSC-20448

Vol. 8, No. 3, P. 389

Thermal Radiation Analyzer System TRASYS II solves radiation related aspects of thermal analysis problems. TRASYS II provides for calculation of internode radiation interchange data and for calculation of incident and absorbed heat rate data originating from environmental radiant heat sources. When TRASYS II used in conjunction with generalized thermal analysis program such as Systems Improved Numerical Differencing Analyzer (SINDA), any thermal problem expressed in terms of lumped parameter RC thermal network solved.

B84-10134

**DATA-GENERATING PROGRAM FOR ASKA MODELING**

A. KARIMI-DECHESH (Rockwell International Corp.) and T. K. CHENG (Rockwell International Corp.)

Jan. 1985

MSC-20644

Vol. 8, No. 3, P. 390

Carrier plate assemblies of NASA Space Shuttle thermal protection system provided for easy access to protected vital parts of Shuttle. Each assembly mounted on substructure with fasteners through holes in protective tiles. Automatic System of Kinematic Analysis (ASKA) finite-element program evaluates these assemblies. PLATEFORT computer program developed as data generator for ASKA modeling. PLATEFORT greatly reduces amount of time and data required for building ASKA model of these assemblies.

B84-10135

**TRANSIENT RESPONSE ANALYSIS**

L. D. BLACKMAN (Rockwell International Corp.)

Jan. 1985

MSC-20590

Vol. 8, No. 3, P. 390

Transient Response Analysis Program, TRAP aids in

analysis of frequency response of force-transmission and shock-damping devices. Devices analyzed with TRAP include hydraulic actuators, automotive shock absorbers and electromechanical actuators.

**B84-10136**

**PREWHIRL JET MODEL**

S. Y. MENG (Rockwell International Corp.), M. JENSEN (Rockwell International Corp.), and E. D. JACKSON  
Jan. 1985

**MFS-19826**

**Vol. 8, No. 3, P. 390**

Simple accurate model of centrifugal or rocket engine pumps provides information necessary to design inducer backflow deflector, backflow eliminator and prewhirl jet in jet mixing zones. Jet design based on this model shows improvement in inducer suction performance and reduced cavitation damage.

**B84-10137**

**MEASURING SIDE LOADS ON BOLTS**

T. O. KILGROVE (CALTECH)

Jan. 1985

**NPO-15705**

**Vol. 8, No. 3, P. 390**

Side loads on clevis bolt measured quickly and easily. Such loads introduced during assembly of bolt and affect operation. Now, unwanted loads determined quantitatively and corrected.

**B84-10138**

**EDDY-CURRENT REFERENCE STANDARD**

H. H. AMBROSE JR. (Rockwell International Corp.)

Jan. 1985

**MFS-19824**

**Vol. 8, No. 3, P. 391**

Magnetic properties of metallic reference standards duplicated and stabilized for eddy-current coil measurements over long times. Concept uses precisely machined notched samples of known annealed materials as reference standards.

**B84-10139**

**FLEXIBLE LIQUID-TRANSPORT TUBE**

E. R. COLLINS JR. (CALTECH)

Jan. 1985

**NPO-15761**

**Vol. 8, No. 3, P. 391**

Flexible tube with zipper type arrangements of U-shaped side ribs and top plates allows liquids both transported and removed.

**B84-10140**

**CONSERVING PURGE GASES**

K. KAN (Rockwell International Corp.), L. BLEWETT (Rockwell International Corp.), and T. NELSON (Rockwell International Corp.)

Jan. 1985

**MFS-19625**

**Vol. 8, No. 3, P. 391**

Two-step flow control adjusts to dimensional changes in purged equipment. Two pressure actuated valves provide two-step control. When turbopump starts, helium flows through both valves. As pump operates its parts expand, clearance decrease and back pressure builds up on valves. At preset back pressure value, one valve closes, reducing helium flow.

**B84-10141**

**SELECTING FLATPACK LEAD-FORMING DIES**

E. L. CHOATE (Honeywell, Inc.)

Jan. 1985

**MFS-25951**

**Vol. 8, No. 3, P. 391**

Optical instrument accurately records unformed lead offset for each flatpack and provides better fit of flatpack to printed wiring board.

**B84-10142**

**COILABLE-COLUMN DEVELOPMENT**

P. R. PREISWERK (Astro Research Corp.), L. A. DINLEY (Astro Research Corp.), and K. KNAPP (Astro Research

Corp.)

Jan. 1985

**MFS-27032**

**Vol. 8, No. 3, P. 391**

Design changes for longeron columns allow fabrication of larger structures.

**B84-10143**

**MAINTAINING CONSTANT LOAD CELL TEMPERATURE**

G. D. VAN MARK (Beech Aircraft Corp.)

Jan. 1985

**MSC-20333**

**Vol. 8, No. 3, P. 391**

Thermal insulation and temperature compensation device maintains constant temperature environment for load cells. At constant temperature, cells measure weight accurately and reproducibly.

**B84-10144**

**DETECTION OF GAS SLUGS IN HEAT PIPES**

J. A. JONES (CALTECH)

Jan. 1985

**NPO-16064**

**Vol. 8, No. 3, P. 391**

Temperature sensing system detects presence of gas slugs in heat pipes. System designed for operation between zero and 70 degrees C and detects noncondensable pockets of gas that result from decomposition of ammonia cooling fluid. Slugs 1 in. (25mm) in length detected.

**B84-10145**

**A POSITIVE-SHUTOFF FUEL VALVE**

J. TOLPEN (Rockwell International Corp.)

Jan. 1985

**MFS-19779**

**Vol. 8, No. 3, P. 392**

Pneumatically actuated ball valve utilizes continuous contact ball seat seals and dynamic delta seals in lieu of bellows to seal against low pressure leads in fuel supply lines.

**B84-10323**

**X-RAY DETERMINATION OF WELD MISALINEMENT**

C. W. NELSON (Beech Aircraft Corp.)

Apr. 1985

**MSC-20418**

**Vol. 8, No. 4, P. 507**

Simple technique uses ordinary X-ray equipment. Weld line between hemispheres of hidden spherical pressure vessel examined for misalignment between hemispheres. Central X-ray tangent to pressure vessel at weld line. Technique not limited to spheres. Also used to check alignment between insulated sections of pipelines or chemical-reaction vessels without removing insulation or interrupting flow or process.

**B84-10324**

**INSULATION DEBOND DETECTION**

G. D. JOHNSTON, A. D. COLEMAN, J. N. PORTWOOD, J. M. SAUNDERS, and A. J. PORTER

Apr. 1985

**MFS-25862**

**Vol. 8, No. 4, P. 508**

Load-cell and acoustic responses indicate bonding condition nondestructively. Signal recorded by load cell direct and instantaneous measure of local stiffness of material at point of impact. Separate and distinctly different measurement that sensed by microphone. Spectrum analysis of pulse obtained from debonded point will only show frequencies below 425 Hz because insulation alone does not have stiffness to support energy at higher frequencies.

**B84-10325**

**DETERMINING THERMAL DIFFUSIVITIES OF RADIATING SPECIMENS**

C. WOOD (CALTECH), R. A. LOCKWOOD (CALTECH), and K. SHIMADA (CALTECH)

Apr. 1985

**NPO-15436; NPO-15441**

**Vol. 8, No. 4, P. 509**

Two heat-pulse techniques eliminate uncertainties due to radiation losses. Flashlamp supplies pulse of heat to one side of specimen. Temperatures of illuminated surface

## 06 MECHANICS

and of opposite surface monitored photometrically. In second method, pulse of electrons supplies heat to one side of specimen. Temperature of opposite side monitored by photon detector. Techniques needed because radiation heat losses in this temperature range introduce uncertainties into conventional heat-flux measurements.

**B84-10326**  
**HIGH-PRESSURE COUPLING FOR OPEN-ENDED TUBES**  
A. N. ANDERSON (Rockwell International Corp.)  
Apr. 1985

**MSC-20451** Vol. 8, No. 4, P. 510  
Temporary fitting easily installed and removed without damage to tubes. Tube-end pressure coupling consists of few parts easy to install and remove. Couplings useful mainly for repeated temporary connections necessary for high pressure testing or prestressing of tubes with finished ends.

**B84-10327**  
**BRAZING ALLOYS INDICATE TURBOMACHINERY TEMPERATURES**

J. W. SCHLAFF (Rockwell International Corp.)  
Apr. 1985  
**MFS-19792** Vol. 8, No. 4, P. 511

Foils serve as consumable thermometers. Stainless-steel tab with circular window holds brazing-foil sample in place. Tab tacked to object to be tested with capacitive-discharge spot welder operating in range  $10 + 1$  joules. After measurements, tabs and samples chiseled off, leaving tested object fairly well intact. Technique used on objects made of alloys with iron, nickel, or cobalt as principal ingredients.

**B84-10328**  
**OVER-THE-WING PROPELLER REDUCES WING DRAG**  
J. L. JOHNSON JR. and R. WHITE (Kentron International, Inc.)  
Apr. 1985

**LAR-13134** Vol. 8, No. 4, P. 512  
Airflow favorably altered if propeller placed above and behind wing. Relocating propeller induces flow over wing airfoil leading edge, which produces leading-edge suction forces not usually attainable by wing in free-stream flow. Concept reduced drag significantly on aircraft model in 12-foot (3.7-meter) wind tunnel. Relocation also helps to reduce cabin noise.

**B84-10329**  
**REUSABLE THERMAL BARRIER FOR INSULATION GAPS**  
C. E. SALADEE (Rockwell International Corp.)  
Apr. 1985

**MSC-20519** Vol. 8, No. 4, P. 512  
Filler composed of resilient, heat-resistant materials. Thermal barrier nestles snugly in gap between two tiles with minimal protrusion beyond faces of surrounding tiles. When removed from gap, barrier springs back to nearly original shape. Developed for filling spaces between tiles on Space Shuttle, also used in furnaces and kilns.

**B84-10330**  
**DIFFERENTIAL PRESSURE HELPS SEAL BALL VALVE**  
J. K. MANGIALARDI (General Electric Co.)  
Apr. 1985

**MSC-20615** Vol. 8, No. 4, P. 513  
Leakage suppressed despite O-ring wear. New design eliminates leakage in vacuum selector valve on Space Shuttle waste-control subsystem. Applied to improve sealing in laboratory and industrial vacuum systems and other plumbing involving switching among lines with pressure differentials of order of 1 atmosphere (0.1 MPa).

**B84-10331**  
**SPECIMEN HOLDER FOR ANALYTICAL ELECTRON MICROSCOPES**  
U. S. CLANTON, A. M. ISAACS (Lockheed), and I. MACKIN-

NON (Microbeam)

Apr. 1985  
**MSC-20398** Vol. 8, No. 4, P. 514

Reduces spectral contamination by spurious X-ray. Specimen holder made of compressed carbon, securely retains standard electron microscope grid (disk) 3 mm in diameter and absorbs backscattered electrons that otherwise generate spurious X-rays. Since holder inexpensive, dedicated to single specimen when numerous samples examined.

**B84-10332**  
**IMPROVED COULOMB-FRICTION DAMPER**  
G. E. CAMPBELL (Rockwell International Corp.)  
Apr. 1985

**MSC-20505** Vol. 8, No. 4, P. 515  
Equal damping provided on forward and reverse strokes. Improved damper has springs and wedge rings symmetrically placed on both ends of piston wedge, so friction force same in both directions of travel. Unlike conventional automotive shock absorbers, they resemble on outside, both versions require no viscous liquid and operate over wide temperature range.

**B84-10333**  
**FUEL-CONSERVATIVE DESCENTS USING A PROGRAMMABLE CALCULATOR**

C. E. KNOX  
Apr. 1985 See Also TP-2085 (N83-17535/NSP)  
**LAR-13138** Vol. 8, No. 4, P. 515

Airborne descent algorithm used with or without time constraints. Concepts provide fuel savings by matching airplane arrival flow to airport acceptance rate through time control computations and allowing pilot to descend at his discretion from cruise altitude to designated metering fix in idle-thrust clean (landing gear up, flaps, zero, and speed brakes retracted) configuration. Also used for planning fuel-conservative descents when time is not consideration.

**B84-10334**  
**STING-MOUNTED FLOW SURVEY APPARATUS**  
G. C. ASHBY JR.

Apr. 1985  
**LAR-13157** Vol. 8, No. 4, P. 516

Flow survey instrumentation integral part of model support system. Drive motor, limit switches, and position transducer contained within streamlined housing and operable in near vacuum wing-tunnel environment. Sting-mounted system has advantages over conventional wall-mounted flow-field survey equipment, include more efficiently utilized run time, higher position accuracy, and fewer runs to map flow field.

**B84-10335**  
**DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS**  
R. W. HESS, W. T. DAVIS, and P. A. DAVIS

Apr. 1985 See Also NASA TM-85687 (N84-10538/NSP)  
**LAR-13094** Vol. 8, No. 4, P. 517

Sinusoidal calibration signal produced in 4- to 100-Hz range. Portable oscillating-pressure device measures dynamic characteristics of pressure transducers installed in models or aircraft at frequency and oscillating-pressure ranges encountered during unsteady-pressure-measurement tests. Calibration is over range of frequencies and amplitudes not available with commercial acoustic calibration devices.

**B84-10336**  
**ACOUSTO-OPTIC EXTENSOMETER FOR BOLTS**

J. MARAM (Rockwell International Corp.) and G. KUHR (Rockwell International Corp.)

Apr. 1985  
**MFS-19914** Vol. 8, No. 4, P. 518

Bolt torque or tension deduced from non contacting measurements. Pulsed Laser induces shockwave in bolt head while continuous-wave acousto-optic detector monitors distortion produced by shock. Shock travel time measured

to determine bolt length. Solid-state position detector relatively inexpensive and keeps down cost of extensometer.

**B84-10337**  
**INTEGRATED EXHAUST-GAS-ANALYSIS SYSTEM**  
R. ANDERSON and R. SUMMERS

Apr. 1985 See Also NASA TM-81592 (N81-23435/NSP)

**LEW-14062** Vol. 8, No. 4, P. 519

Gas-Analysis system includes eight commercial gas analyzers and data-processing and calibration electronics. Two microprocessors range analyzers, calibrate system, process raw data to units of concentration, and make all system information available to facility research computer and to operator. After initial setup, system operates several hours without significant operator attention. Saves considerable operator time.

**B84-10338**  
**MULTIPURPOSE PHOTONIC TRANSDUCERS**

E. R. DU FRESNE (CALTECH) and W. L. DOWLER (CALTECH)

Apr. 1985

**NPO-15135** Vol. 8, No. 4, P. 520

Features include smallness and noise immunity. Photonic transducer is interferometer with two arms. Small relative axial motions of mirrors detected as shifts in interference pattern. Version measures temperature changes via differential expansion or contraction of stalks. New transducers smaller (typical size less than 1 cm) and coupled to monitoring equipment with optical fibers instead of wires. Well suited to biomedical instrumentation.

**B84-10339**  
**DERIVING STRAIN MODES FROM VIBRATIONAL TESTS**

J. W. YOUNG (Structural Dynamics Research Corp.) and J. C. JOANIDES (Rockwell International Corp.)

Apr. 1985

**MSC-20587** Vol. 8, No. 4, P. 521

Measurements and theoretical analysis complement each other. Experimental acceleration and strain data used to calculate coefficients of low-frequency vibrational modes of object under test. An iterative comparison of experimental and calculated strains give modal model of improved accuracy that predicts strains under operating conditions. Method useful in fatigue life and reliability analyses of buildings, pumps, engines, vehicles, and other systems subject to vibrations and loud noises during operation.

**B84-10340**  
**ACTIVE PULSE SUPPRESSION OF STRUCTURAL VIBRATIONS**

F. UDWADIA (CALTECH)

Apr. 1985

**NPO-15788** Vol. 8, No. 4, P. 522

Corrective opposing vibrations reduce Earthquake damage. Algorithm for controlling reactions of buildings and other structures to Earthquake initiates counterpulses when incoming shock pulses exceed threshold level. By using 'go/no-go' criterion rather than continuously adjusting response to every input excitation no matter how small, control system needs less computation effort than comparable closed-loop systems.

**B84-10341**  
**CONSTANT-OPERATING-RESISTANCE HOT-WIRE PROBE**

P. C. STAINBACK

Apr. 1985

**LAR-13144** Vol. 8, No. 4, P. 523

Effects of lead-wire-resistance changes with temperature nullified. Constant-operating-resistance hot-wire probe uses two sets of leads. Exposed to identical conditions, comparison of resistance gives change in sensing element itself. Data taken in more convenient manner, with advantage of not having to constantly check for possible changes in lead resistance and consequently readjust potentiometer.

**B84-10342**  
**HOT-WIRE PROBE FOR COMPRESSIBLE SUBSONIC FLOW**

P. C. STAINBACK, C. B. JOHNSON, and C. B. BASNETT (SDC)

Apr. 1985

**LAR-13051** Vol. 8, No. 4, P. 524

Probe measures velocity, density, and total temperature fluctuations. Three-wire probe used with each wire operating at different overheat ratio. Technique extendable into transonic and low supersonic flow regimes without difficulty except for those problems usually associated with lengthy calibration and possible wire breaking.

**B84-10343**  
**MEASURING THE LIQUID CONTENT OF A GAS**

D. H. BEEKMAN (Martin Marietta Corp.) and L. H. METHNER (Martin Marietta Corp.)

Apr. 1985

**MFS-25990** Vol. 8, No. 4, P. 525

Instrument is adaptation of hot-wire anemometer. Hot-wire anemometer detects liquid droplets entrained in flowing gas. Droplets impinge on probe and carry away heat as vaporized. Power required to maintain probe at constant resistance and elevated temperature gives measure of amount of liquid present. Instrument used in steam turbines to check for condensation and detect fog at airports and highways, generating control signal to turn on fog lights.

**B84-10344**  
**CONTINUOUS-FILAMENT ISOGRID COMPOSITE PANEL**

J. G. WILLIAMS, R. J. PALMER (McDonnell Douglas Corp.), and A. T. TUCCI (McDonnell Douglas Corp.)

Apr. 1985

**LAR-12975** Vol. 8, No. 4, P. 527

Damaged panels do not fail catastrophically when fabricated this way. Isogrid stiffener formed in slotted silicon-rubber tool. At grid intersections, slots offset to prevent excessive buildup of composite material and widened to give room for overlapping filaments to spread when compressed. Following total failure of skin, isogrid stiffener still carries 350 kN/m (2,000 lb/in.) and remains intact.

**B84-10345**  
**THERMAL-BALANCE STRIP FOR FLUTED LFC PANELS**

P. BONO (McDonnell Douglas Corp.)

Apr. 1985

**LAR-12991** Vol. 8, No. 4, P. 527

Waviness of less than 0.004 inch achieved using titanium strips. Process uses titanium balancing strips to keep waviness within 0.004 inch limit. Balancing strips reduce thermal bonding stresses on lower fiberglass fluted sections and placed so fiberglass ends up sandwiched between porous titanium skin and titanium balance strip. Method requires less skill and less labor intensive than composite-wrapped-mandrel method.

**B84-10346**  
**SILICONE-RUBBER TOOLING FOR HOLLOW PANELS**

F. H. GALLIMORE (McDonnell Douglas Corp.)

Apr. 1985

**LAR-12974** Vol. 8, No. 4, P. 527

Wave-free contour surface obtained by using flexible mold. Silicone-rubber layup tool, when used in conjunction with hard plastic laminating mold defining desired contour, produces panel with wave-free surface that accurately reproduces shape of mold. In addition to providing porous hollow-panel wing structure that acts as duct for transporting sucked boundary layer tooling, also used to fabricate high-strength lightweight door panels and any single-or compound-contour panel.

**B84-10347**  
**QUICK-CHANGE HOLDER FOR AERONAUTICAL-RESEARCH MICROPHONES**

## 06 MECHANICS

R. COHN

Apr. 1985

**FRC-11072**

**Vol. 8, No. 4, P. 528**

Mounting holds microphone flush with aircraft surface and maintains pressure seal. Microphones, which measure dynamic pressure and shock waves as they pass over aircraft fuselage or other experimental body, mounted through fuselage flush with outside surface. Besides being faster and easier to use than older mounts, new mount prevents damage to microphone on removal because no sealant to be cut and scraped away.

**B84-10348**

**MICROPHONE DETECTS BOILER-TUBE LEAKS**

S. P. PARTHASARATHY (CALTECH)

Apr. 1985

**NPO-16027**

**Vol. 8, No. 4, P. 529**

Unit simple, sensitive, rugged, and reliable. Diaphragm-less microphone detects leaks from small boiler tubes. Porous plug retains carbon granules in tube while allowing pressure changes to penetrate to granules. Has greater life expectancy than previous controllers and used in variety of hot corrosive atmospheres.

**B84-10349**

**IN-PLACE CALIBRATION OF INSTRUMENTATION MICROPHONES**

R. B. COHN (Dryden Flight Research Facility)

Apr. 1985

**ARC-11463**

**Vol. 8, No. 4, P. 530**

Accidental damage and decalibration prevented. Linearity, sensitivity, and frequency response of microphone measured with commercial sound generator modified so placed directly over or under microphone. Artificial voice connected to oscillator and measuring amplifier. Requisite frequencies and sound pressures applied to microphone, and microphone output recorded. New calibration method used on aircraft and wind-tunnel microphones.

**B84-10350**

**SYNCHRONOUSLY DEPLOYABLE TRUSS**

H. G. BUSH, M. K. MIKULAS JR., and R. E. WALLSOM (Kentron International, Inc.)

Apr. 1985

**LAR-13117**

**Vol. 8, No. 4, P. 531**

Double-layered truss structure compactly packaged and synchronously deployed. Synchronously deployable truss constructed of two surface layers of struts, arranged in triangles, connected by 'tripods' of equal-length core struts. Mechanism powered by passive spring and damped by hydraulic-damping cylinder. When released, spring drives slider linked to core and surface struts. Variety of truss geometries, including curved structures, contemplated.

**B84-10351**

**DEPLOYABLE GEODESIC TRUSS**

M. M. MIKULAS JR., M. D. RHODES, and J. W. SIMONTON

Apr. 1985

**LAR-13113**

**Vol. 8, No. 4, P. 532**

Efficiently packaged structure deployed or retracted easily. In preliminary two-bay model each bay has sets of battens connected by two longitudinal crossed members that give bay axial and torsional stiffness. Cross-members hinged in center to fold for packaging. Bays deployed and stabilized by actuators connected between center hinges of cross-members.

**B84-10352**

**ADJUSTABLE MOUNT**

E. A. CROSSLEY, H. C. JONES, D. P. HAYNES, and I. W. JONES

Apr. 1985

**LAR-13100**

**Vol. 8, No. 4, P. 534**

Remotely-controlled adjustable mount operates in vacuum environments. Mount consists of jacking-screw arrangement to control vertical direction. Gear-driven lead

screw controls other horizontal direction, while rack-and-pinion gears control azimuth and pitch. Adjustments made independently of each other.

**B84-10353**

**GAS-DENSITY GAGE**

W. BERNSTERIN (William Marsh Rice University) and J. MCGARITY (William Marsh Rice University)

Apr. 1985

**MFS-28011**

**Vol. 8, No. 4, P. 534**

Lightweight density gage that operates over broad pressure range accurately measures gas pressures.

**B84-10354**

**CAPTURE-RANGE INDICATOR**

C. HELLER

Apr. 1985

**MFS-28008**

**Vol. 8, No. 4, P. 534**

Position indicator allows rapid positioning and linkage of payloads. Device shortens capture time and provides less-stressful linkage on operator.

**B84-10355**

**MEASURING CLEARANCE INDIRECTLY**

W. C. JOHNSON (Rockwell International Corp.) and B. O. WESTBERG (Rockwell International Corp.)

Apr. 1985

**MFS-19875**

**Vol. 8, No. 4, P. 534**

Plot of deflection versus load indicates clearance between internal pins and wall.

## 07 MACHINERY

**B84-10146**

**STEPPED-PIN CLEVIS RESISTS JAMMING**

T. O. KILLGROVE (CALTECH)

Jan. 1985

**NPO-15834**

**Vol. 8, No. 3, P. 395**

Pin modification allows pyrotechnic release devices to operate more smoothly. New clevis pin has stepped diameters to prevent bending as it exits yoke. In contrast, conventional unstepped clevis pin bends and jams as it is withdrawn. Stepped pin design suitable for explosive and possible hammer driven pin pullers.

**B84-10147**

**FORKLIFT SUPPORT DOLLY**

W. YOUNG (A. & M. Machine Co.) and H. C. WITCHER

Jan. 1985

**GSC-12916**

**Vol. 8, No. 3, P. 396**

Long, heavy loads handled safely. Forklift support dolly enables operator to manipulate safely large sections of materials around corners and through narrow aisles and doorways. Dolly has pivoting tandem wheels for maneuverability. Plate laid out lengthwise along truck axis, with one end clamped to forklift and other end clamped to dolly. With this arrangement, minimum width of passage determined by short side of plate rather than by long side.

**B84-10148**

**FASTER RESPONSE FOR MEMORY-METAL ACTUATORS**

C. F. RUOFF (CALTECH)

Jan. 1985

**NPO-16120**

**Vol. 8, No. 3, P. 396**

Cooling accelerated by attaching Peltier junction. Electric current carries heat to or from junction between two dissimilar metals, direction of heat flow depending on direction of current and particular metals used. Direction of



current is opposite to that of same two metals operating as thermocouple.

**B84-10149  
SEALING MECHANICAL CRYOGENIC COOLERS**  
R. RICHTER (CALTECH)

Jan. 1985

**NPO-15139**

**Vol. 8, No. 3, P. 397**

Metal bellows used to seal Vuilleumier and Stirling-cycle cryogenic coolers, replacing sliding seals that failed after only 3,000 hours of service. Metal bellows, incorporated in displacer design provide nonrubbing dynamic seal. Lifetime of cryogenic cooler no longer limited by loss of sealing material and by deterioration of regenerators due to clogging by seal debris.

**B84-10150  
VACUUM SEAL PERMITS LIMITED ROTATION**  
F. LOMBARDI (CALTECH)

Jan. 1985

**NPO-15115**

**Vol. 8, No. 3, P. 398**

Flexible metal seal permits rotation of object in vacuum chamber. Seal made from two cylindrical azimuthally fluted bellows attached to ends of cylindrical axially fluted bellows with connecting tubes at both ends. Designed for rotation of sample probes in electron spectroscopy for chemical analysis (ESCA), other applications likely.

**B84-10151  
AUTOMATIC COAL-MINING SYSTEM**  
E. R. COLLINS JR. (CALTECH)

Jan. 1985

**NPO-15861**

**Vol. 8, No. 3, P. 398**

Coal cutting and removal done with minimal hazard to people. Automatic coal mine cutting, transport and roof-support movement all done by automatic machinery. Exposure of people to hazardous conditions reduced to inspection tours, maintenance, repair, and possibly entry mining.

**B84-10152  
THE EFFECT OF WIND ON THE AERODYNAMIC RESISTANCE OF HIGHWAY VEHICLES**  
B. DAYMAN JR. (CALTECH)

Jan. 1985

**NPO-14771**

**Vol. 8, No. 3, P. 399**

CARYAW predicts effects of wind on aerodynamic resistance of vehicles. Determines effect of winds on fuel consumption and determines effects of vehicle speed on fuel consumption for wide variety of wind conditions.

**B84-10153  
STANDARD FASTENER LIBRARY**  
J. J. TEJWANI (Rockwell International Corp.), T. R. KELLY (Rockwell International Corp.), and M. L. MARKE (Rockwell International Corp.)

Jan. 1985

**MSC-20645**

**Vol. 8, No. 3, P. 400**

Program for use with graphics system creates library of standard fastener hardware. Programs categorized by fastener geometric shape with tabulated sizes. Fastener details recalled by configuration and size for insertion into drawing on screen. Program used in production of engineering drawings for Space Shuttle orbiter.

**B84-10154  
AERODYNAMIC DESIGN OF ROAD VEHICLES**  
D. W. KURTZ (CALTECH)

Jan. 1985 See Also NASA CR-163744 (N81-12943/NSP)

**NPO-15474**

**Vol. 8, No. 3, P. 400**

Guidebook discusses design of road vehicles to reduce aerodynamic drag. Book presents strategy for integrating aerodynamic design into vehicle design. Book written for readers lacking experience in aerodynamics.

**B84-10155  
INEXPENSIVE PRESSURE-RELIEF VALVE**

E. A. THEODORE (Rockwell International Corp.)

Jan. 1985

**MSC-20518**

**Vol. 8, No. 3, P. 400**

Simple device vents excess low-pressure gas. Inexpensive pressure relief valve built from polyvinylchloride pipe. Valve suitable for low pressure-- 25 to 50 cm of mercury-- and flow rates up to 14 m<sup>3</sup>/min.

**B84-10156  
BOLT INSERTS FOR LIGHTNING PROTECTION**

K. O. HAMBROCK (Martin Marietta Corp.)

Jan. 1985

**MFS-25918**

**Vol. 8, No. 3, P. 400**

Stainless steel bolt fasteners have adequate grounding paths for protection of structures against lightning strikes. Fasteners particularly useful in sections where insulating material required, such as thermal panels of external storage tank.

**B84-10157  
SOLAR-POWERED FLYWHEEL**

F. J. NOLA

Jan. 1985

**MFS-25978**

**Vol. 8, No. 3, P. 400**

Energy-storage system has 20 year lifetime. Electrical power source consisting of flywheel and electronic control system stores solar energy. Flywheel developed for space vehicles features good weight-to-energy storage ratios and used as control gyroscope for maneuvering.

**B84-10158  
CLAMP SECURES MATERIAL TO CYLINDER BASE**

Y. S. TAM (Rockwell International Corp.)

Jan. 1985

**MFS-19479**

**Vol. 8, No. 3, P. 400**

Two-part clamp assembled around pipe or post, ends not free. Resistance welding clamp to post and locking ring to lower part of clamp permanently fixes clamp in place, preventing thermal cycling from loosening clamp.

**B84-10159  
REMOTELY OPERATED GRIPPER TRACKS APPLIED FORCE**

G. C. BURNS (McDonnell Douglas Corp.)

Jan. 1985

**MSC-20241**

**Vol. 8, No. 3, P. 401**

Operator 'feel' incorporated into new design. Remotely controlled gripper grasps holds, and maneuvers items not equipped with grapple fixture and no preplanned interface with gripper.

**B84-10160  
PILLAR-TRIMMING SYSTEM**  
E. R. COLLINS JR. (CALTECH)

Jan. 1985

**NPO-15848**

**Vol. 8, No. 3, P. 401**

Trimming and reinforcing of coal pillars allows more coal recovery. Conceptual coal-pillar trimming machine use two counterrotating cutting drums to take corners off roof support pillars in coal mines.

**B84-10161  
PERFORMANCE TESTING OF THE DOE ELECTRIC TEST VEHICLE**

D. W. KURTZ (CALTECH), J. A. BRYANT (CALTECH), and T. W. PRICE (CALTECH)

Jan. 1985

**NPO-15660**

**Vol. 8, No. 3, P. 401**

Report describes total system testing and evaluation of electrically powered automobile.

**B84-10162  
INERT-GAS ELECTRICAL DISCHARGE MACHINING**

V. RAMANI (Rockwell International Corp.) and M. L.

## 07 MACHINERY

CASSIDENTI (Rockwell International Corp.)

Jan. 1985

**MFS-19778**

**Vol. 8, No. 3, P. 401**

Holes in complicated hardware successfully drilled by dry EDM process that uses tubular copper electrode and argon or helium gas as dielectric medium.

**B84-10163**

**COUNTERSINK DRILL**

R. J. HERNANDEZ (Rockwell International Corp.)

Jan. 1985

**MFS-19852**

**Vol. 8, No. 3, P. 401**

Efficient drill design for countersinking or metal drilling uses only two flutes instead of three and made of carbide instead of 'high-speed' steel. Tool performance and service life increased.

**B84-10164**

**TWO-PHASE WET/DRY ENGINE FOR WASTE-HEAT RECOVERY**

D. G. ELLIOTT (CALTECH)

Jan. 1985

**NPO-15621**

**Vol. 8, No. 3, P. 401**

Novel supersonic fluid expansion nozzle used to vaporize toluene (or other drying-type organic liquid) by expansion through two-phase region to drive impulse turbine in Rankine-cycle engine.

**B84-10165**

**KICK-FREE PRESSURE RELEASE VALVE**

T. O. KILLGROVE (CALTECH)

Jan. 1985

**NPO-16078**

**Vol. 8, No. 3, P. 402**

Release valve for smoothly venting buildup of gas pressure modified to reduce kickback of mechanism during discharge.

**B84-10166**

**MAGNETIC DESPINNING SYSTEM**

G. F. VON TIESENHAUSEN

Jan. 1985

**MFS-25966**

**Vol. 8, No. 3, P. 402**

Electrical coil reduces spinning and tumbling speed of orbiting satellites through eddy-current braking. Induction of eddy currents into skin of satellite by electromagnetic field produces torques that oppose rotation.

**B84-10167**

**MEMORY-METAL STEPPING MOTOR**

R. S. JAMIESON (CALTECH)

Jan. 1985

**NPO-15482**

**Vol. 8, No. 3, P. 402**

Compact stepping motor for applications requiring high torque at slow speeds made with helical spring clutch and electrically-heated memory-metal actuator.

**B84-10168**

**DIVERTER LIP FOR SEAL**

E. JACKSON III (Rockwell International Corp.) and D.

JOHNSON (Rockwell International Corp.)

Jan. 1985

**MFS-19891**

**Vol. 8, No. 3, P. 402**

Proposed one-piece design change for cooling turbine rotor disks eliminates temperature differential that normally causes thermal stresses and cracks.

**B84-10169**

**MEASURING THE RUNOUT ON A ROTARY SHAFT**

R. BEATTY (Rockwell International Corp.) and J. FENWICK

(Rockwell International Corp.)

Jan. 1985

**MFS-19694**

**Vol. 8, No. 3, P. 402**

Runout on shaft such as on pump shaft in liquid oxygen environment measured by device employing pair of pistons placed 90 degrees apart and in contact with shaft.

**B84-10356**

**SAFETY PEDAL FOR FOOT-OPERATED MACHINERY**

G. D. GARCIA (Rockwell International Corp.)

Apr. 1985

**MSC-20535**

**Vol. 8, No. 4, P. 537**

Ninged structure prevents inadvertent use. Forward motion of foot on yoke plate necessary to operate brake pedal. Downward force on yoke plate turns locking/releasing lever, which then pushes locking pin into indexing hole. New pedal improves both productivity and safety of power brakes and such other machines as metal shearers and punch presses.

**B84-10357**

**BRIDLE ATTACHMENT FOR AIRCRAFT SPIN-RECOVERY PARACHUTE**

W. L. WHITE

Apr. 1985

**LAR-13076**

**Vol. 8, No. 4, P. 538**

Antispin rolling moment produced by chute drag force. Parachute stowed prior to deployment. At deployment, bridle attachment produces antispin rolling moment. At recovery, parachute forces are in aircraft plane of symmetry. Attachment system reduces parachute diameter typically required for spin recovery of experimental aircraft during hazardous flight testing.

**B84-10358**

**COMPACT ANTISPIN PARACHUTE SYSTEM**

R. D. WHIPPLE

Apr. 1985

**LAR-12979**

**Vol. 8, No. 4, P. 539**

Costs and complexity of parachute system greatly reduced. Rigid towline parachute system operates in three steps: (1) When aircraft begins to spin, parachute compartment opened up, and parachute unfolds; (2) Parachute deployed and spin terminated; and (3) Parachute released. Advantage of towline system allows use of much smaller parachute, reducing design loads on structural reinforcement. Also, complex pyrotechnic-deployment or jettison systems no longer necessary.

**B84-10359**

**GARTER VALVES**

P. JENCEK (Rockwell International Corp.)

Apr. 1985

**MFS-19899**

**Vol. 8, No. 4, P. 540**

Small subvalves opened and closed simultaneously. Precisely-machined mating rings act as valves. Rings seal against each other to stop fluid flow. Rings deformed or moved relative to each other to uncover holes and permit flow. Valve controls flow rate of fuel into burner.

**B84-10360**

**DEGREASER REDUCES SOLVENT LOSS**

E. R. DU FRESNE (CALTECH)

Apr. 1985

**NPO-16128**

**Vol. 8, No. 4, P. 541**

Escape of solvent minimized by second cooling coil. Degreaser suppresses solvent-vapor loss through parts-basket dragout and air drafts. Within CO2 blanket, convection repeatedly exposes CO2/solvent mixture to cold spot created by CO2 coil. Solvent vapor condenses, then runs down via through to cold tank. This small expenditure of CO2 minimizes health and environmental hazards.

**B84-10361**

**TAPERED RING SEAL**

D. P. FLEMING

Apr. 1985 See Also NASA TP-1646 (N80-19495/NSP)

**LEW-10455**

**Vol. 8, No. 4, P. 541**

Centering force maximized by decreased seal clearance in flow direction. Increased centering force prevents contact between seal and shaft, eliminating seal wear. Ring seals used to restrict fluid leakage between rotating shaft and

nonrotating housing. Seal used in Space Shuttle main engine oxygen pump.

#### B84-10362

##### REACTIONLESS WINCH

B. E. BOSWELL (McDonnell Douglas Corp.)

Apr. 1985

MSC-20440

Vol. 8, No. 4, P. 542

Hand-held tool serves variety of uses. Housing of Winch includes simple controls and reaction handle that serves as stowage for ratcheting crank handle. Winch used by divers working underwater. Also used for pulling vehicles out of mud, lifting heavy objects, or tightening cables.

#### B84-10363

##### REMOTE COUPLING OF ELECTRICAL CONNECTORS

R. T. BARBOUR (Rockwell International Corp.)

Apr. 1985

MSC-20414

Vol. 8, No. 4, P. 543

Device aligns plug and receptacle axially and radially. Standard multiple-pin plug and socket mounted in mechanism. As threaded shaft moves out from its mounting bracket, two sets of petals engage each other and correct misalignment. Misalignment absorbed by spring-mounted swivels. Designed for umbilical cables between Space Shuttle and payload, mechanism adaptable to other remote or hazardous situations in which human not available to connect mating parts by hand.

#### B84-10364

##### TOOL FOR INSERTING AND REMOVING TUBE PLUGS

O. G. MOLINA (Rockwell International Corp.) and A. G. PASCUA (Rockwell International Corp.)

Apr. 1985

MFS-19871

Vol. 8, No. 4, P. 544

Simple handtool used with both straight and bent tubes. Plug consisting of two expandable O-rings pushed into or pulled out of tube with this flexible tool. Flexible shaft of tool threaded at inner (plug) end to engage or disengage plug when knurled handle turned. Results exceptionally low friction between shaft and tube. Allows insertion and removal of plug carefully controlled.

#### B84-10365

##### IGNITION-SPARK DETECTOR FOR ENGINE TESTING

G. KUHR (Rockwell International Corp.)

Apr. 1985

MFS-19890

Vol. 8, No. 4, P. 544

Optical fiber views sparks directly. In fuel or oxidizer tube, optical fiber collects light from ignition spark. Fibers also used to collect light from combustion reactions for spectrographic analysis. Useful in engine testing, detector helps determine reason for engine failure.

#### B84-10366

##### HINGED SHIELDS FOR MACHINE TOOLS

J. B. LALLANDE, W. W. POLAND, and S. TULL

Apr. 1985

GSC-12915

Vol. 8, No. 4, P. 545

Flaps guard against flying chips, but fold away for tool setup. Clear plastic shield in position to intercept flying chips from machine tool and retracted to give operator access to workpiece. Machine shops readily make such shields for own use.

#### B84-10367

##### HOLDING CARGO IN PLACE WITH FOAM

T. T. FISHER (Lockheed Missiles & Space Co., Inc.)

Apr. 1985

MSC-20723

Vol. 8, No. 4, P. 546

Foam fills entire container to protect cargo from shock and vibration. Originally developed for stowing space debris and spent satellites in Space Shuttle for return to Earth, encapsulation concept suitable for preparing shipments carried by truck, boat, or airplane. Equipment automatically injects polyurethane foam into its interior to hold cargo

securely in place. Container of rectangular or other cross section built to match shape of vehicle used.

#### B84-10368

##### AUTOMATIC ROBOT SAFETY SHUTDOWN SYSTEM

M. LIRETTE (Martin Marietta Corp.)

Apr. 1985

MFS-25969

Vol. 8, No. 4, P. 546

Robot turned off if acceleration exceeds preset value. Signals from accelerometer on robot arm pass through filter and amplifier, eliminating high-frequency noise and hydraulic pump pulsations. Data digitized and processed in computer. Unit controls other machines that perform repetitive movements, including rotary tables, tracked vehicles, conveyor lines, and elevators.

#### B84-10369

##### EDM ELECTRODE FOR INTERNAL GROOVES

V. RAMANI (Rockwell International Corp.) and A. WERNER (Rockwell International Corp.)

Apr. 1985

MFS-19733

Vol. 8, No. 4, P. 547

Electroerosive process inexpensive alternative to broaching. Hollow brass electrodes, soldered at one end to stainless-steel holding ring, held in grooves in mandrel. These electrodes used to machine grooves electrically in stainless-steel tube three-eighths inch (9.5 millimeters) in diameter. Tool used on tubes already in place in equipment.

#### B84-10370

##### SETUP AID FOR ELECTRICAL-DISCHARGE MACHINING

G. LINES (Rockwell International Corp.) and J. DUCA (Rockwell International Corp.)

Apr. 1985

MFS-19874

Vol. 8, No. 4, P. 548

Interlock assures that workpiece is correctly assembled in machining fixture. A Plunger in a Hollow Shaft actuates a switch, allowing a power supply to produce current for electrical-discharge machining. Plunger operates only when necessary parts are position.

#### B84-10371

##### PROPELLER DESIGN PROGRAM

W. H. PHILLIPS

Apr. 1985

LAR-13141; LAR-13142

Vol. 8, No. 4, P. 548

Planform and propeller twist with minimum induced loss calculated. New Theoretical treatment combines classical theories of Betz-Prandtl, Goldstein, and Glauert easily applied to problem of determining propeller blade geometry for minimum induced loss. Analysis applicable at subsonic flight speeds and neglects structural considerations in propeller design.

#### B84-10372

##### HYBRID-VEHICLE TRANSMISSION SYSTEM

G. LUPO (Centro Ricerche Fiat S.p.A.) and G. DOTTI (Centro Ricerche Fiat S.p.A.)

Apr. 1985

NPO-16119

Vol. 8, No. 4, P. 549

Continuously-variable transmission system for hybrid vehicles couples internal-combustion engine and electric motor section, either individually or in parallel, to power vehicle wheels during steering and braking.

#### B84-10373

##### EVENING FLOW DISTRIBUTION THROUGH PARALLEL TUBES

S. C. BRAY (General Electric Co.), P. W. DIETZ (General Electric Co.), and H. JASTER (General Electric Co.)

Apr. 1985

MFS-23936

Vol. 8, No. 4, P. 549

Flow nonuniformity in parallel tubes reduced by introducing pressure drops. Total flow maintained and controlled by varying main inlet valve position.

## 07 MACHINERY

### B84-10374 LINEAR BOOM ACTUATOR E. F. KOCH (CALTECH)

Apr. 1985

NPO-16099

Vol. 8, No. 4, P. 550

Actuator stabilizes spacecraft spin by varying length of support struts that hold spacecraft booms. Variation changes spin axis and controls wobble. Linear actuator controls spacecraft wobble applicable in rotating systems on Earth.

### B84-10375 SAFETY EVALUATION METHODOLOGY FOR MINING SYSTEMS W. F. ZIMMERMAN (CALTECH)

Apr. 1985

NPO-15831

Vol. 8, No. 4, P. 550

Methodology evaluates design of proposed mining systems. Analysis tests proposed mining systems against specifications and hazards of existing similar systems, examines soundness of new design in terms of reducing or eliminating major health and safety hazards, and identifies major design weaknesses.

### B84-10376 HIGH-TEMPERATURE PUMP R. R. HALE (CALTECH) and A. R. MCDUGAL (CALTECH)

Apr. 1985

NPO-15783

Vol. 8, No. 4, P. 550

Heat exchanger in water-cooled pumps allows high-temperature operation.

### B84-10377 POWER TRAIN FOR HYBRID ELECTRIC VEHICLE H. C. VIVIAN (CALTECH)

Apr. 1985

NPO-15742

Vol. 8, No. 4, P. 550

Power train of hybrid electric vehicle enables internal-combustion engine and electric motor to operate near same constant speed except when off or idling.

### B84-10378 ADJUSTABLE TUNING SPRING FOR BELLOWS PUMP G. L. GREEN (Pan American World Airways, Inc.), D. TU DUC (Pan American World Airways, Inc.), and S. HOOPER (Pan American World Airways, Inc.)

Apr. 1985

MSC-20512

Vol. 8, No. 4, P. 550

Adjustable leaf spring increases maximum operating pressure of pump from 2 to over 60 psi (13 to over 400 kN/m<sup>2</sup>). Small commercial bellows pump using ac-powered electromagnet to vibrate bellows at mechanical resonance modified to operate over wider pressure range.

higher production speed, lower cost, and good control of crystal quality.

### B84-10171 RECIPROCATING SAW FOR SILICON WAFERS

A. D. MORRISON (CALTECH) and E. R. COLLINS JR. (CALTECH)

Jan. 1985

NPO-15863

Vol. 8, No. 3, P. 406

Concept increases productivity and wafer quality. Cutting wafers from silicon ingots produces smooth wafers at high rates with reduced blade wear. Involves straight reciprocating saw blade and slight rotation of ingot between cutting strokes. Many parallel blades combined to cut many wafers simultaneously from ingot.

### B84-10172 PRODUCTION LINE FOR DENDRITIC-WEB SOLAR CELLS

D. J. PAGE (Westinghouse Electric Corp.)

Jan. 1985

NPO-15098

Vol. 8, No. 3, P. 407

Direct inclusion of web-growth furnaces in production line expected to result in lower costs than current production processes using silicon wafers sliced from Czochralski boules. Silicon-web input capacity of line is 0.5 m<sup>2</sup>/min, which corresponds to total peak-power output of about 25 MW for 1 year of production. Line employs about 18 production people per shift and requires about 3,650 square feet of floorspace.

### B84-10173 MACHINING OF SILICON-RIBBON-FORMING DIES

A. A. MENNA (Mobil Tyco Solar Energy Corp.)

Jan. 1985

NPO-15127

Vol. 8, No. 3, P. 408

Carbon extension for dies used in forming silicon ribbon crystals machined precisely with help of special tool. Die extension has edges beveled toward narrow flats at top, with slot precisely oriented and centered between flats and bevels. Cutting tool assembled from standard angle cutter and circular saw or saws. Angle cutters cuts bevels while slot saw cuts slot between them. In alternative version, custom-ground edges or additional circular saws also cut flats simultaneously.

### B84-10174 AUTOMATICALLY DRESSING BLADES IN SILICON-WAFER CUTTING

A. D. MORRISON (CALTECH)

Jan. 1985

NPO-15745

Vol. 8, No. 3, P. 408

Inserts incorporated in support beams for silicon ingots automatically 'dress' cutting blade during wafer slicing. Segments of blade-dressing material placed at regular intervals in graphite beam. Blade cuts into segments and dressed without operator intervention and without interrupting regular machine operation. Manual dressing eliminated, and production rates increased.

### B84-10175 HIGH-MOBILITY EPITAXIAL SILICON WAFERS

R. STERMER JR., A. FRIPP JR., A. JONES (Rockwell International Corp.), J. MCMULLEN (Rockwell International Corp.), H. MANASEVIT (Rockwell International Corp.), I. GERGIS (Rockwell International Corp.), and S. SOCLÖF (Rockwell International Corp.)

Jan. 1985

LAR-12846

Vol. 8, No. 3, P. 409

New technique produces high-mobility multilayer films suitable for use on silicon process line. New material is multilayer film of alternate layers of silicon and alloy of silicon and germanium. Films grown thus far have electron mobilities 50 percent greater than epitaxial silicon films grown previously.

## 08 FABRICATION TECHNOLOGY

### B84-10170 TWO-CRUCIBLE CZOCHRALSKI PROCESS

G. FIEGL (Siltec Corp.) and W. TORBET (Siltec Corp.)

Jan. 1985

NPO-15110

Vol. 8, No. 3, P. 405

Scheme for continuous melt replenishment increases capacity of Czochralski crystal-growing furnace. Replenishing and drawing crucibles of improved Czochralski apparatus connected by heated quartz siphon. When doped silicon added to replenishing crucible, liquid silicon flows into drawing crucible, equalizing two melt levels. Addition of new material automatically controlled in response to optically sensed melt level. Results of this semicontinuous operation

B84-10176

**RAPID ADHESIVE BONDING FOR METALS AND COMPOSITES**B. A. STEIN, J. R. TYERYAR, R. L. FOX, S. E. STERLING JR., and J. D. BUCKLEY  
Jan. 1985

LAR-13066

Vol. 8, No. 3, P. 410

Toroidal induction heater is key element in rapid bonding technique. Rapid adhesive bonding equipment features toroid induction heater for quick bonding of composites and metals. Process avoids damaging composites that cannot withstand high temperatures for long time intervals. Process scaled up for production. Technique suited to bonding of end tabs onto material test specimens.

B84-10177

**COLLAPSIBLE AND DEPLOYABLE TRUSSES**

R. A. NELSON (Vought Corp.)

Jan. 1985

MFS-25945

Vol. 8, No. 3, P. 411

Cable-controlled mechanisms allow large structures stored in small spaces. Combination of telescoping struts and pivot points allows very large structure collapsed into very small one. Concept used not only for straight but for tapered or curved ones as well. Structure adaptable to terrestrial uses as portable towers, scaffolds, and bridge beams folded compactly for transportation or storage.

B84-10178

**HOT-DIPPED METAL FILMS AS EPITAXIAL SUBSTRATES**

P. J. SHLICHTA (CALTECH)

Jan. 1985

NPO-15904

Vol. 8, No. 3, P. 412

Multistep process forms semiconductor devices on macrocrystalline films of cadmium or zinc. Solar-cell fabrication processes use hot-dipped macrocrystalline films on low-cost sheet-metal base as substrates for epitaxy. Epitaxial layers formed by variety of methods of alternative sequence paths. Solar cells made economically by forming desired surface substance directly on metal film by chemical reactions.

B84-10179

**DECONTAMINATING ALUMINUM/AMMONIA HEAT PIPES**

J. A. JONES (CALTECH)

Jan. 1985

NPO-16066

Vol. 8, No. 3, P. 413

Internal gas slugs reduced or eliminated. Manufacturing method increases efficiency of aluminum heat pipes in which ammonia is working fluid by insuring pipe filled with nearly pure charge of ammonia. In new process heat pipe initially closed with stainless-steel valve instead of weld so pipe put through several cycles of filling, purging, and accelerated aging.

B84-10180

**POLYURETHANE MASKS LARGE AREAS IN ELECTROPLATING**

J. L. BEASLEY (Rockwell International Corp.)

Jan. 1985

MFS-19825

Vol. 8, No. 3, P. 413

Polyurethane foam provides effective mask in electroplating of copper or nickel. Thin layer of Turco maskant painted on area to be masked. Layer ensures polyurethane foam removed easily after served its purpose. Component A, isocyanate, and component B, polyol, mixed together and brushed or sprayed on mask area. Mixture reacts, yielding polyurethane foam. Foam prevents deposition of nickel or copper on covered area. New method saves time, increases productivity and uses less material than older procedures.

B84-10181

**VENTED COMPRESSION MOLDING OF GRANULE-FILLED RESINS**

J. O. MCCREE (Martin Marietta Aerospace Corp.) and L. ERWIN (Martin Marietta Aerospace Corp.)

Feb. 1985

MFS-25975

Vol. 8, No. 3, P. 414

Resins filled with granules formed to final size and shape in new process. New vented compression molding method takes less time than conventional method. Vacuum-bagging and machining stages eliminated. Part emerges from mold in final size and shape. Suitable for making variety of parts with simple shapes, vented compression molding takes less time and cost less than older processes.

B84-10182

**ALIGNING HEAT-EXCHANGER TUBES FOR ASSEMBLY**

K. A. BENSON (Rockwell International Corp.)

Feb. 1985

MFS-19857

Vol. 8, No. 3, P. 415

Simple support method makes costly jigs and fixtures unnecessary. 'Dummy' tubes installed at regular intervals to support 'real' tubes before real tubes installed, filled with Cerrobend (or equivalent) material, metallic substance with low melting point, makes dummy tubes rigid so they brace real tubes as installed. When all available spaces for real tubes filled, dummy tubes removed and replaced with real tubes.

B84-10183

**BEAM-CAP-FORMING MACHINE**

W. MARX (Grumman Aerospace Corp.)

Feb. 1985 See Also CR-170642 (N83-11158/NSP)

MFS-27007

Vol. 8, No. 3, P. 415

Graphite reinforced plastic strip transformed into continuous beam cap. Report describes machine that fabricates beam caps from graphite reinforced thermoplastic materials supplied as strip stock.

B84-10184

**MATCHING IMPEDANCES AND MODES IN ACOUSTIC LEVITATION**

M. B. BARMATZ (CALTECH)

Feb. 1985

NPO-16022

Vol. 8, No. 3, P. 416

Temperature differences accommodated with tunable coupler. Report discusses schemes for coupling sound efficiently from cool outside atmosphere into hot acoustic-levitation chamber. Theoretical studies have practical implications for material-processing systems that employ acoustic levitation.

B84-10185

**ACOUSTIC LEVITATION WITH ONE DRIVER**

T. G. WANG (CALTECH), I. RUDNICK (CALTECH), D. D. ELLEMAN (CALTECH), and J. D. STONEBURNER (CALTECH)

Feb. 1985

NPO-15793

Vol. 8, No. 3, P. 416

Report discusses acoustic levitation in rectangular chamber using one driver mounted at corner. Placement of driver at corner enables it to couple effectively to acoustic modes along all three axes. Use of single driver reduces cost, complexity and weight of levitation system below those of three driver system.

B84-10186

**PRICE ESTIMATION GUIDELINES**

R. G. CHAMBERLAIN (CALTECH), R. W. ASTER (CALTECH), P. J. FIRNETT (CALTECH), and M. A. MILLER (CALTECH)

Feb. 1985

NPO-15569

Vol. 8, No. 3, P. 417

Improved Price Estimation Guidelines, IPEG4, program provides comparatively simple, yet relatively accurate estimate of price of manufactured product. IPEG4 processes user supplied input data to determine estimate of price per unit of production. Input data include equipment cost, space required, labor cost, materials and supplies cost, utility

## 08 FABRICATION TECHNOLOGY

expenses, and production volume on industry wide or process wide basis.

### **B84-10187 ASSEMBLY-LINE MANUFACTURING INDUSTRY SIMULATION**

R. G. CHAMBERLAIN (CALTECH) and P. J. FIRNETT (CALTECH)  
Feb. 1985

**NPO-16032** Vol. 8, No. 3, P. 417

Assists in economic analysis of production line manufacturing. Originally developed to estimate product price received by hypothetical U.S. industry that manufactures silicon solar modules for use in electricity generation, SAMIS extended and generalized to extent that it simulates operation of many different production line manufacturing industries and/or companies.

### **B84-10188 TWO-PULSE STITCH WELDING**

C. J. TORBORG (Honeywell, Inc.)

Feb. 1985

**MFS-25716** Vol. 8, No. 3, P. 418

Second welding pulse at about 20 percent higher energy repairs bad single-pulse welds. Method used successfully to weld polytetrafluoroethylene-insulated nickel wire to stainless-steel terminals in back-plane wiring.

### **B84-10189 SONICALLY-WELDED THERMAL BLANKETS**

R. BETTINI (The Perkin-Elmer Corp.) and F. CITRIN (The Perkin-Elmer Corp.)

Feb. 1985

**MFS-25806** Vol. 8, No. 3, P. 418

Insulating layers joined by seams. Sonic welding saves time and reduces weight. Layers of blanket built up from alternating layers of polyester sheet and polyester net. Paper pattern showing lines along which layers are joined together placed over top layer.

### **B84-10190 FABRICATION OF THICK GOLD STRIP LINES**

C. M. GEE (Hughes Aircraft Co.), H. L. GARVIN (Hughes Aircraft Co.), and K. ROBINSON (Hughes Aircraft Co.)

Feb. 1985

**NPO-16238** Vol. 8, No. 3, P. 418

Ion-beam etching and masking techniques fabricate micron-sized gold strip lines. Fabricated by use of argon ion-beam milling.

### **B84-10191 MAGNETIC CHUCK FOR PRECISE GRINDING**

R. A. CARVER (Rockwell International Corp.)

Feb. 1985

**MFS-19764** Vol. 8, No. 3, P. 418

Handling time substantially reduced. Magnetic grinding chuck used for fabricating parts that have thin, delicate geometries requiring close tolerances.

### **B84-10192 IMPROVED MELT-LEVEL CONTROL SYSTEM**

D. L. MEIER (Westinghouse Electric Corp.)

Feb. 1985

**NPO-15900** Vol. 8, No. 3, P. 418

Laser feedback control automatically maintains silicon melt levels. During long-term growth of dendritic-web silicon, silicon melt level controlled and held nearly constant using laser feedback system to sense level of melt and control silicon-pellet feed rate.

### **B84-10193 SILICON-WEB-GROWING MACHINE**

C. DUNCAN (Westinghouse Electric Corp.)

Feb. 1985

**NPO-15870** Vol. 8, No. 3, P. 418

Silicon replenished automatically as web is withdrawn.

Semiautomatic silicon-web-growing machine set down in detailed engineering drawings. Melt level sensed with He/Ne laser beam and melt-level error signal used to control motor-driven pellet feeder, speeding up when level is low. System reduces demand upon operator's time.

### **B84-10194 MINIMIZING CONVECTION DURING CRYSTAL GROWTH**

P. J. SHLICHTA

Feb. 1985

**NPO-15811** Vol. 8, No. 3, P. 419

Buoyant convection during crystal growth from solution minimized in experiment cell using boundary-layer stabilizing configurants such as downward isothermal growth or upward growth into thermal gradient.

### **B84-10195 AUTOMATED TEXTURIZATION OF SILICON WAFERS**

S. CHITRE (Photowatt International, Inc.), C. SNYDER (Photowatt International, Inc.), G. JONES (Photowatt International, Inc.), and P. MARLOWE (Photowatt International, Inc.)

Feb. 1985

**NPO-15816** Vol. 8, No. 3, P. 419

Two-stage texturization of either single-crystal or polycrystalline wafers improves conversion efficiency of finished solar cells.

### **B84-10196 RECIPROCATING CRYSTALLIZER**

R. B. LAL (Alabama A & M University) and M. AGGARWAL (Alabama A & M University)

Feb. 1985

**MFS-25948** Vol. 8, No. 3, P. 419

Automatic crystallizer grows crystals from aqueous solutions. Crystals grown from aqueous solutions by slow cooling of growth solution along with forced convection to increase mass transfer.

### **B84-10197 IMPURITY EFFECTS ON DENDRITIC GROWTH**

M. E. GLICKSMAN (Rensselaer Polytechnic Institute)

Feb. 1985

**MFS-25672** Vol. 8, No. 3, P. 419

Measurements of effects of soluble impurity addition on dendritic growth rates and morphology allow testing of theoretical dendritic growth models.

### **B84-10198 ACOUSTIC SORTER FOR SMALL PARTS**

T. G. WANG (CALTECH) and E. W. LEUNG (CALTECH)

Feb. 1985

**NPO-15913** Vol. 8, No. 3, P. 419

Sorting system uses acoustic resonance chamber, detects, and rejects anomalous parts on automated assembly line. System particularly suited to small nuts, bolts, pins, and assemblies which previously required expensive three dimensional television-monitoring systems to prevent misfeeds.

### **B84-10199 SQUARE-CUTTING GRINDER**

G. B. DENNIS (Boeing Services International)

Feb. 1985

**KSC-11257** Vol. 8, No. 3, P. 419

Attachment to grinder used to cut small pipe ends square and smooth, ready for welding. Attachment simple plate bracket fastened to air pencil grinder held against pipe flange to guide grinder.

### **B84-10200 HOLDER FOR STRAIGHTENING BENT TUBES**

A. R. TURNER (Rockwell International Corp.) and E. D. POLZIEN (Rockwell International Corp.)

Feb. 1985

**MFS-19705** Vol. 8, No. 3, P. 420

One-piece holder restrains bent metal tube against further bending during straightening operation. Holder consists of handle 16 in. (41 cm) long welded to short, strong tube that fits around tube to be straightened.

**B84-10201**

**ANNULAR-TUBE REINFORCER**

R. PESSIN (Rockwell International Corp.)

Feb. 1985

**MFS-19738**

**Vol. 8, No. 3, P. 420**

Cylindrical tool inserts support sleeves into annular space between coaxial tubes to provide local reinforcement. Tool particularly useful when space between outer ends of coaxial tubes is narrow, requiring thin sleeve.

**B84-10379**

**OPTICAL-FIBER-WELDING MACHINE**

W. C. GOSS (CALTECH), W. A. MANN (CALTECH), and R. GOLDSTEIN (CALTECH)

Apr. 1985

**NPO-15004**

**Vol. 8, No. 4, P. 554**

Technique yields joints with average transmissivity of 91.6 percent. Electric arc passed over butted fiber ends to melt them together. Maximum optical transmissivity of joint achieved with optimum choice of discharge current, translation speed, and axial compression of fibers. Practical welding machine enables delicate and tedious joining operation performed routinely.

**B84-10380**

**ROOF POLISHING OF OPTICAL FIBERS**

A. R. DHOLAKIA (RCA Corporation)

Apr. 1985

**LAR-13070**

**Vol. 8, No. 4, P. 554**

Beveled tip gives optimum coupling efficiency. Abrasive tape used to grind tip of optical fiber. Grinding force depends on stiffness of optical fiber. 'Roof' shape on end of optical glass fiber increases efficiency which couples laser light. End surface angle of 65 degrees with perpendicular required for optimum coupling. Since fiber and tape are light in weight and compliant, ridge defect-free, and chipping on fiber edge totally eliminated.

**B84-10381**

**FABRICATING UNDERWATER ELECTROACOUSTIC TRANSDUCERS**

R. L. FERGUSON and R. W. LOVELADY

Apr. 1985

**LAR-13007**

**Vol. 8, No. 4, P. 555**

Use of retainer ring instead of adhesives simplifies assembly and disassembly. Underwater electroacoustical transducer assembly uses precast silicone rubber compressed between ceramic crystal and metal container. Removable retainer ring holds assembly in place. Method provides proper stress loading, speed and ease of assembly, and way of removing transducer without damaging crystal.

**B84-10382**

**PRESTRESSED THERMAL-PROTECTION PANELS**

T. J. DUNN

Apr. 1985

**MSC-20254**

**Vol. 8, No. 4, P. 556**

Panels held securely with minimum of mounting hardware. Each panel held in place by single screw that pulls it into flat shape from its original shallow-dish shape. Shape and prestressing make panel stiff; resists vibration and withstands large mechanical loads. Panel shape and mounting arrangement not limited to thermal-protection systems but also used on aircraft, building walls, or wherever large surfaces must be covered with stiff, flat sheets easily removed for maintenance.

**B84-10383**

**SORTING TITANIUM WELDING RODS**

W. D. ROSS JR. (Rockwell International Corp.) and R. L. BROWN (Rockwell International Corp.)

Apr. 1985

**MSC-20588**

**Vol. 8, No. 4, P. 557**

Three types of titanium welding wires identified by their resistance to current flow. Welding-wire tester quickly identifies unknown titanium alloy wire by touching wire with test probe, and comparing meter response with standard response. Before touching wire, tip of test probe dipped into an electrolyte.

**B84-10384**

**FLUORESCENT GAGE INDICATION**

C. E. BARNS, B. L. GILBAUGH, B. GIN, W. L. HOLT, P. LESAK, R. MANCINI, and H. F. SPENCER

Apr. 1985

**ARC-11397**

**Vol. 8, No. 4, P. 558**

Transfer of dye shows quality of contact between two mating parts. Mating parts checked for fit by spreading fluorescent dye on one, making brief light contact with other, and looking (under UV light) for transferred dye. Dye offers greater visibility under ultraviolet illumination, allowing better indication of how precisely parts match and what areas interfere.

**B84-10385**

**SOLAR-ARRAY SUBSTRATE FROM GLASS-REINFORCED CONCRETE**

J. L. EIRLS (MB Associates)

Apr. 1985

**NPO-15077**

**Vol. 8, No. 4, P. 558**

Design eliminates glass superstrate and associated metal framing. Panel has two trapezoidal stiffening ribs for structural support. Strategic placement of ribs with embedded support tubes (standard PVC tubing) minimizes bending moments and resulting stresses produced by installation and windloads. Glass-reinforced concrete panel has smooth flat surface suitable for solar substrate and includes structural bracing for rigidity and design adaptable to mass production.

**B84-10386**

**BONDING TECHNIQUE FOR STIFFENED-SKIN STRUCTURES**

P. O. FRICKLAND (CALTECH), E. L. HEADRICK (CALTECH), and T. HASEGAWA (CALTECH)

Apr. 1985

**NPO-15994**

**Vol. 8, No. 4, P. 559**

Consistent bond thickness achieved even in large, complicated parts. Spring Clamp positions and holds parts assembled on tooling plate. Stiffener and backing bar held against adhesive layer by clamp. Spring action of clamp keeps steady force on pieces as they cure, insuring consistent bond thickness.

**B84-10387**

**SOLDER BONDING FOR POWER TRANSISTORS**

H. A. SNYTSHEUVEL (TRW, Inc.) and H. MANDEL (TRW, Inc.)

Apr. 1985

**MSC-20570**

**Vol. 8, No. 4, P. 559**

Indium solder boosts power rating and facilitates circuit changes. Efficient heat conduction from power transistor to heat sink provided by layer of indium solder. Low melting point of indium solder (141 degrees C) allows power transistor to be removed, if circuit must be reworked, without disturbing other components mounted with ordinary solder that melts at 181 degrees C. Solder allows devices operated at higher power levels than does conventional attachment by screws.

**B84-10388**

**EDGE LABELS FOR MULTILAYER CIRCUIT BOARDS**

P. J. ROSSI (Rockwell International Corp.)

Apr. 1985

**MSC-20704**

**Vol. 8, No. 4, P. 560**

Quick visual inspection identifies out-of-place layers. Small copper pads or other labels on layers present regular

## 08 FABRICATION TECHNOLOGY

pattern if multilayer circuit board properly assembled and irregular pattern if one or more layers in wrong place. New method faster, cheaper, and more reliable than earlier methods.

**B84-10389**

### **GLASS/EPOXY DOOR PANEL FOR AUTOMOBILES**

J. L. BAUER JR. (CALTECH)

Apr. 1985

**NPO-15057**

**Vol. 8, No. 4, P. 561**

Lightweight panel cost-effective. Integrally-molded intrusion strap key feature of composite outer door panel. Strap replaces bulky and heavy steel intrusion beam of conventional door. Standard steel inner panel used for demonstration purposes. Door redesigned to exploit advantages of composite outer panel thinner. Outer panel for automobile door, made of glass/epoxy composite material, lighter than conventional steel door panel, meets same strength requirements, and less expensive.

**B84-10390**

### **STRIPPING THE SHEATH FROM STRANDED CABLES**

A. L. PRISK (CALTECH) and J. W. ROTTA (CALTECH)

Apr. 1985

**NPO-15082**

**Vol. 8, No. 4, P. 561**

Device similar to tubing cutter removes tough plastic cover. Insulation stripper is 3 in. (7.6 cm) long and 1.5 (3.8 cm) in diameter. Two rollers are small-diameter bearings. Cutter blade journaled for rotation between pair of similar bearings. Bearings either pin or ball types of suitable dimensions.

**B84-10391**

### **GRAVITATIONAL EFFECTS ON CRYSTAL GROWTH BY VAPOR TRANSPORT**

J. A. ZOUTENDYK (CALTECH) and W. M. AKUTAGAWA (CALTECH)

Apr. 1985

**NPO-15853**

**Vol. 8, No. 4, P. 562**

Crystal-growth apparatus makes it possible to measure growth rates in three directions: up, down, and horizontal. Sealed in quartz ampoule, charge of source material vaporizes and condenses in crystalline state at colder end of tube. Apparatus allows effect of gravity on crystal growth determined quantitatively.

**B84-10392**

### **MAKING CUBIC SILICON CARBIDE SEMICONDUCTORS**

J. POWELL, H. WILL, and S. NISHINO (Kyoto University)

Apr. 1985

**LEW-14018**

**Vol. 8, No. 4, P. 563**

Thin buffer layer of SiC minimizes effects of lattice mismatch. Approach consists of growing single-crystal layer of cubic SiC on single-crystal silicon (Si) wafer by chemical-vapor deposition (CVD). Process developed for production of large-area single-crystal wafers of cubic silicon carbide (SiC) for semiconductor devices; also used to make devices themselves. Applications include electronics for high temperature (up to 900 C) and electronics for very high frequencies.

**B84-10393**

### **GAS ATMOSPHERES IMPROVE SILICON-RIBBON QUALITY**

F. V. WALD (Mobil Tyco Solar Energy Corp.) and J. P. KALEJS (Mobil Tyco Solar Energy Corp.)

Apr. 1985

**NPO-15129**

**Vol. 8, No. 4, P. 564**

Growing crystal surrounded by gas containing carbon or oxygen. Ribbon of solid silicon, edgewise, grows from pool of molten silicon in die. Gases flowing through orifice ensure longer diffusion length and less contamination by carbide particles in product.

**B84-10394**

### **CONTOURED ORIFICE FOR SILICON-RIBBON DIE**

B. H. MACKINTOSH (Mobil Tyco Solar Energy Corp.)

Apr. 1985

**NPO-15126**

**Vol. 8, No. 4, P. 565**

Die configuration encourages purity and stable growth. Contour of die orifice changes near ribbon edges. As result, silicon ribbon has nearly constant width and little carbon contamination. Die part of furnace being developed to produce high-quality, low-cost material for solar cells.

**B84-10395**

### **TOP-COATING SILICON ONTO CERAMIC**

J. D. HEAPS (Honeywell, Inc.), L. D. NELSON (Honeywell, Inc.), and J. D. ZOOK (Honeywell, Inc.)

Apr. 1985

**NPO-15125**

**Vol. 8, No. 4, P. 565**

Polycrystalline silicon for solar cells produced at low cost. Molten silicon poured from quartz trough onto moving carbon-coated ceramic substrate. Doctor blade spreads liquid silicon evenly over substrate. Molten material solidifies to form sheet of polycrystalline silicon having photovoltaic conversion efficiency greater than 10 percent. Method produces 100-um-thick silicon coatings at speed 0.15 centimeter per second.

**B84-10396**

### **BONDING HEAT-RESISTANT FABRIC TO TILE**

J. W. HOLT (Rockwell International Corp.) and L. W. SMISER (Rockwell International Corp.)

Apr. 1985

**MSC-20540**

**Vol. 8, No. 4, P. 566**

Acid etching, densification, and silica cement ensure strong bond. Key step in preparation for bonding to glazed tile is etching quartz fabric and tile with acid. This increases adhesion of silica cement used to form bond. Procedures use high-temperature materials exclusively and therefore suitable for securing flexible seals and heat barriers around doors and viewing ports in furnaces and kilns.

**B84-10397**

### **EXPLOSIVE WELDING FOR REMOTE APPLICATIONS**

L. J. BEMENT

Apr. 1985

**LAR-13119**

**Vol. 8, No. 4, P. 567**

Explosive seam welding produces up to 100-percent joint strength. Ribbon explosive activated by remote energy source produces metallurgically sound joint. Success of technique verified for joints between like metals and joints between two different metals. Applications include structural assembly in toxic atmospheres and in radioactive or otherwise hazardous environments.

**B84-10398**

### **WELDING MANY THIN METAL LAYERS**

B. O. HARTWELL (Ametek), P. CARAS (Ametek), and P. H. HOBBS (Ametek)

Apr. 1985

**MSC-20698**

**Vol. 8, No. 4, P. 568**

Electron-beam welding yields reliable, leakproof joints. Welding bands (also called 'doublers') sandwiched between layers welded to increase final weld-section thickness. New technique ensures repeatable leakproof assemblies.

**B84-10399**

### **STRONG, LIGHTWEIGHT CURVED PANELS**

R. MOLHO (McDonnell Douglas Corp.) and H. L. BESTOR (McDonnell Douglas Corp.)

Apr. 1985

**MSC-16278**

**Vol. 8, No. 4, P. 569**

Sandwich construction gives panels structural efficiency. Large panels with compound curvatures are formed from a honeycomb core faced with sheets of graphite/epoxy cloth and tape. Developed for pod on Space Shuttle, construction readily adapted to curved skin panels on cars, trucks, and airplanes.

**B84-10400**

### **TAPE-MOUNTED THERMOCOUPLE**



K. S. MACDAVID (CALTECH)

Apr. 1985

NPO-16291

Vol. 8, No. 4, P. 569

Thermocouple junctions soldered to copper-foil adhesives allow easy assembly.

B84-10401

CONNECTOR-ARRAY ATTACHMENT MATRIX

T. J. MALONEY (AIA Research Corp.)

Apr. 1985

NPO-15778

Vol. 8, No. 4, P. 569

Factory-assembled electrical/mechanical connectors on flexible sheets improve installation efficiency.

B84-10402

SNAPRING QUICK FASTENER

A. H. WILSON (CALTECH)

Apr. 1985

NPO-15724

Vol. 8, No. 4, P. 569

Snapring fastener allows quick attachment and detachment of solar panels. Springy structure bent to fit any recess, making solar-panel removal or repair extremely simple.

B84-10403

SPlicing EFFICIENTLY COUPLES OPTICAL FIBERS

G. F. LUTES (CALTECH)

Apr. 1985

NPO-16294

Vol. 8, No. 4, P. 569

Method of splicing single-mode optical fibers results in very low transmission losses through joined fiber ends. Coupling losses between joined optical-fiber ends only 0.1 dB. Method needs no special operator training.

B84-10404

AUTOMATED SOLAR-PANEL FABRICATOR

J. J. HAGERTY (MB Associates)

Apr. 1985

NPO-16205

Vol. 8, No. 4, P. 569

Automated computer-controlled system based on standard commercial industrial robot takes solar cells and other raw materials and assembles them into completed solar panels.

B84-10405

CLOSE-OUT PLUGS

T. ADAMS (Rockwell International Corp.)

Apr. 1985

MFS-19370

Vol. 8, No. 4, P. 570

Externally-applied circular plug seals holes in walls up to 0.44 (12 mm) in diameter.

B84-10406

ACOUSTIC LEVITATION SYSTEM

P. M. GAMMELL (CALTECH), T. G. WANG (CALTECH), A. CROONQUIST (CALTECH), and M. C. LEE (CALTECH)

Apr. 1985

NPO-16146

Vol. 8, No. 4, P. 570

Dense materials, such as steel balls, continuously levitated with energy provided by efficient high-powered siren in combination with shaped reflector. Reflector system, consisting of curved top reflector and flat lower reflector, eliminates instability in spatial positioning of sample.

B84-10407

ACOUSTIC POSITION SERVOSYSTEM

E. W. LEUNG (CALTECH), C. P. LEE (CALTECH), and T. G. WANG (CALTECH)

Apr. 1985

NPO-15936

Vol. 8, No. 4, P. 570

Servosystem automatically centers levitated objects within given volume.

B84-10408

HEAT-SHIELD GAP FILLER

D. B. LEISER, D. A. STEWART, M. SMITH, C. ESTRELLA, and H. E. GOLDSTEIN

Apr. 1985

ARC-11310

Vol. 8, No. 4, P. 570

Ceramic cloth strips provide flexible, easily replaceable insulating filler. Filler prevents hot gas from flowing between heat-shield tiles while allowing space for thermal expansion and contraction. Strips easily replaced when necessary.

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MATHEMATICS AND  
INFORMATION SCIENCES

B84-10202

CALCULATING CLOSED-LOOP SENSITIVITY TO PARAMETER VARIATIONS

D. B. SCHAECHTER (CALTECH)

Feb. 1985

NPO-15941

Vol. 8, No. 3, P. 423

Performance sensitivity calculated by back substitution. Original Lyapunov equation differentiated two times with respect to parameter p. Each differential turns out to yield Lyapunov equation for first and second derivatives with respect to parameter p of steady-state covariance of state variables. Derivatives desired closed-loop performance sensitivities.

B84-10203

TECHNI-KITS AND TECHNI-KIT BUILDING SYSTEMS

E. D. CALLENDER (CALTECH), C. HARTSOUGH (CALTECH), R. V. MORRIS (CALTECH), and Y. YAMAMOTO (CALTECH)

Feb. 1985

NPO-15956

Vol. 8, No. 3, P. 423

Techni-kits consists of theories, methods, standards and computer based tools that assist in design of information-intensive systems. Techni-kit 'building system' is techni-kit that builds techni-kits.

B84-10204

FAST TWO-DIMENSIONAL DIGITAL-FILTER HARDWARE

T. R. EDWARDS

Feb. 1985

MFS-25876

Vol. 8, No. 3, P. 424

Report describes principles of hardware implementation of two-dimensional 5 by 5 convolute-integer low pass filter. Filter processes image data points fast enough for real-time use in image analysis and enhancement.

B84-10205

DESIGN PRIMER FOR REED-SOLOMON ENCODERS

M. PERLMAN (CALTECH) and J. J. LEE (CALTECH)

Feb. 1985 See Also NASA CR-16974 (N83-17141/NSP)

NPO-15568

Vol. 8, No. 3, P. 424

Design and operation of Reed-Solomon (RS) encoders discussed in document prepared as instruction manual for computer designers and others in dataprocessing field. Conventional and Berlekamp architectures compared. Engineers who equip computer memory chips with burst-error and dropout detection and correction find report especially useful.

B84-10206

RESEARCH-CONCEPT EVALUATION

M. J. WHITE (ARINC Research Corp.) and W. KOLB (ARINC Research Corp.)

Feb. 1985

LAR-13143

Vol. 8, No. 3, P. 425

Concepts ranked according to potential benefit/cost ratios. ARINC Research Concept Evaluation Methodology (ARCEM) program provides powerful tool for organization and planning of research activities indicating which con-

## 09 MATHEMATICS AND INFORMATION SCIENCES

cepts provide greatest benefit for investment and determines number of concepts implemented to justify expenditures for development of generic technologies.

**B84-10207**

### **RELATIONAL INFORMATION MANAGEMENT DATA-BASE SYSTEM**

O. O. STORAASLI, W. J. ERICKSON (Boeing Commercial Airplane Co.), F. P. GRAY (Boeing Commercial Airplane Co.), D. L. COMFORT (Boeing Commercial Airplane Co.), S. O. WAHLSTROM (Boeing Commercial Airplane Co.), and G. VON LIMBACH (Boeing Computer Services Co.)  
Feb. 1985

**LAR-12943; LAR-12944; LAR-12945 Vol. 8, No. 3, P. 425**

DBMS with several features particularly useful to scientists and engineers. RIM5 interfaced with any application program written in language capable of Calling FORTRAN routines. Applications include data management for Space Shuttle Columbia tiles, aircraft flight tests, high-pressure piping, atmospheric chemistry, census, university registration, CAD/CAM Geometry, and civil-engineering dam construction.

**B84-10208**

### **SDDL: SOFTWARE DESIGN DOCUMENTATION LANGUAGE**

H. KLEINE (CALTECH), D. E. CALLENDER (CALTECH), and T. M. ZEPKO (CALTECH)  
Feb. 1985

**NPO-16201; NPO-16202 Vol. 8, No. 3, P. 426**

Promotes effective communications between software designer and user. SDDL successful on tasks ranging from small, one-person informal projects to large projects of hundreds of formally published pages of design.

**B84-10209**

### **SOFTWARE COST-ESTIMATION MODEL**

R. C. TAUSWORTHE (CALTECH)

Feb. 1985

**NPO-15862**

**Vol. 8, No. 3, P. 426**

Software Cost Estimation Model SOFTCOST provides automated resource and schedule model for software development. Combines several cost models found in open literature into one comprehensive set of algorithms. Compensates for nearly fifty implementation factors relative to size of task, inherited baseline, organizational and system environment and difficulty of task.

**B84-10210**

### **SOFTWARE DESIGN ANALYZER SYSTEM**

R. C. TAUSWORTHE (CALTECH)

Feb. 1985

**NPO-16234**

**Vol. 8, No. 3, P. 426**

CRISP80 software design analyzer system a set of programs that supports top-down, hierarchic, modular structured design, and programing methodologies. CRISP80 allows for expression of design as picture of program.

**B84-10211**

### **INTEGRATED PROCUREMENT MANAGEMENT SYSTEM, VERSION II**

L. J. COLLIER (Computer Science Corp.)

Feb. 1985

**MSC-20278**

**Vol. 8, No. 3, P. 427**

Integrated Procurement Management System, Version II (IPMS II) is online/ batch system for collecting developing, managing and disseminating procurementrelated data at NASA Johnson Space Center. Portions of IPMS II adaptable to other procurement situations.

**B84-10212**

### **LANGUAGE FOR ALLOCATION AND NETWORK SCHEDULING**

J. K. WILLOUGHBY (Science Applications, Inc.)

Feb. 1985

**MSC-20633**

**Vol. 8, No. 3, P. 427**

Programing Language for Allocation and Network Scheduling, Plans, handles many scheduling requirements of Space Shuttle program. Also generalized, high-level tree manipulation language.

**B84-10213**

### **A VISUALLY ORIENTED TEXT EDITOR**

J. E. GOMEZ (CALTECH)

Feb. 1985

**NPO-15088**

**Vol. 8, No. 3, P. 427**

HERMAN employs Evans & Sutherland Picture System 2 to provide screenoriented editing capability for DEC PDP-11 series computer. Text altered by visual indication of characters changed. Group of HERMAN commands provides for higher level operations. HERMAN provides special features for editing FORTRAN source programs.

**B84-10214**

### **STRUCTURED FORTRAN PREPROCESSOR**

J. A. FLYNN (CALTECH), C. L. LAWSON (CALTECH), W. VAN SNYDER (CALTECH), and H. N. TSITSIVAS (CALTECH)

Feb. 1985

**NPO-15726**

**Vol. 8, No. 3, P. 428**

SFTRAN3 supports structured programing in FORTRAN environment. Language intended particularly to support two aspects of structured programing -nestable single-entry control structures and modularization and top-down organization of code. Code designed and written using these SFTRAN3 facilities have fewer initial errors, easier to understand and less expensive to maintain and modify.

**B84-10215**

### **NASTRAN NASTPLT PLOTTING POST PROCESSOR**

R. STRANG (Computer Sciences Corp.)

Feb. 1985

**GSC-12833**

**Vol. 8, No. 3, P. 428**

NASTRAN NASTPLT Plotting Post Processor reads NASTRAN-generated NASTPLT plot files, checks file contents for validity and translates NASTPLT plot commands into appropriate calls to plotting routines for either CALCOMP Tektronix PLOT10, or Versatec plotting systems.

**B84-10216**

### **ALGORITHM SOLVES CONSTRAINED AND UNCONSTRAINED OPTIMIZATION PROBLEMS**

M. A. DENSON (McDonnell Douglas Corp.)

Feb. 1985

**MSC-20683**

**Vol. 8, No. 3, P. 428**

Is quasi-Newton iteration utilizing Broyden/Fletcher/Goldfarb/Shanno update on inverse Hessian matrix. Capable of solving constrained optimization unconstrained optimization and constraints only problems with one to five independent variables from one to five constraint functions and one dependent function optimized.

**B84-10217**

### **HANDLING SOFTWARE REQUESTS FOR COMMANDS**

W. KING JR. (IBM Corp.)

Feb. 1985

**KSC-11226**

**Vol. 8, No. 3, P. 429**

Software component created expressly to provide interface between dedicated command buffer and components requesting command issuance. Component resolves problems that arise when software processes command requests from other subsystems and several requests received at approximately same time.

**B84-10218**

### **PRIORITY-BASED DISPATCHING ALGORITHM**

G. OUZTS (IBM Corp.)

Feb. 1985

**KSC-11277**

**Vol. 8, No. 3, P. 429**

Tasks assigned to different queues based on priority. Proposed algorithm controls execution of transient tasks of different priorities in real-time computation.

**B84-10219****MORE EFFICIENT STRUCTURAL DESIGN BY OPTIMALITY CRITERIA**

R. LEVY (CALTECH)

Feb. 1985

**NPO-15832; NPO-15993****Vol. 8, No. 3, P. 429**

Computer algorithm aids in selection of active constraints on structural design via optimality-criterion method-highly useful way of ensuring lightweight, low-cost structures.

**B84-10220****ADDING STALE-DATA FLAG TO AND ERROR-CORRECTING CODE**

N. BELL SR. (IBM Corp.), J. BURKAVAGE (IBM Corp.), and J. WICKS (IBM Corp.)

Feb. 1985

**KSC-11134****Vol. 8, No. 3, P. 429**

A suitable constant 'exclusive-Or'd' with ECC to flag data without impairing detection of correctable errors.

**B84-10221****ROOT-LOCUS ALGORITHMS**

E. R. WECHSLER (CALTECH)

Feb. 1985

**NPO-16154****Vol. 8, No. 3, P. 430**

Two algorithms for use on programmable pocket calculators allow plotting of individual points on root-locus diagram with or without time delay.

**B84-10222****ALGORITHMS FOR FINITE-ELEMENT EQUATIONS**

M. A. SALAMA (CALTECH), R. MELOSH (Duke University), and S. UTKU (Duke University)

Feb. 1985

**NPO-16029****Vol. 8, No. 3, P. 430**

Five direct and five iterative algorithms for finite element equations in linear equilibrium problems investigated for number of parallel computer architectures and their basic computation methods compared.

**B84-10223****SOFTWARE-IMPLEMENTATION PLAN**

G. JACOBSON (CALTECH) and A. SPINAK (CALTECH)

Feb. 1985

**NPO-16123****Vol. 8, No. 3, P. 430**

Top-down implementation plan provides a methodology for solving problems in or aiding software engineering design.

**B84-10224****TEST SEQUENCES FOR REED-SOLOMON ENCODERS**

J. J. LEE (CALTECH)

Feb. 1985

**NPO-15542****Vol. 8, No. 3, P. 430**

Theory of Reed-Solomon codes yields sequences of input test symbols. Two specific sequences worked out for codes of 8 bits per symbol with 223 information symbols and 32 parity check symbols per code words. Test patterns also used for decoders.

**B84-10409****FLIGHT-STABILITY EXTREMES CALCULATED FROM THE UNCERTAINTY ELLIPSE**

D. F. DOMINIK (Rockwell International Corp.)

Apr. 1985

**MSC-20308****Vol. 8, No. 4, P. 573**

Tangents and normals to ellipse derived for situations with two correlated aerodynamic force or moment variables having normally (Gaussian) distributed uncertainty. Although transformations and vector calculations tedious when done by hand, equations in closed form and give rapid results when performed by computers or programmable desk calculators. Probability extremes of ratios and magnitude obtained directly, without repeated table lookup or other complication.

**B84-10410****PREDICTING THE RELIABILITY OF SOLAR-CELL INTER-CONNECTIONS**

G. R. MON (CALTECH), D. M. MOORE (CALTECH), and R. G. ROSS JR. (CALTECH)

Apr. 1985

**NPO-15976****Vol. 8, No. 4, P. 574**

The reduction of life expectancy by thermal cycling calculated during design. Connections between solar cells critical parts of solarcell arrays generating electric power. Reliability affects life expectancy of modules, panels, and arrays. Used to predict stress-cycle lifetimes of such structures as arches, walkways, cylindrical ribbing of aircraft fuselages and submarine hulls, and pipeline expansion loops. Testing costs reduced by about 90 percent.

**B84-10411****PREDICTING SEVERE DUSTSTORMS**

P. M. WOICHESHYN (CALTECH)

Apr. 1985

**NPO-14999****Vol. 8, No. 4, P. 575**

Combined human/machine forecasting technique shows promise. Severe duststorms in Great Plains forecast with fair reliability. Forecasts derived from combination of human expertise and variety of meteorological information sources, including all current and recent weather observations, standard National Meteorological Center (NMC) computer analyses for surface and upper air, and NMC 12-, 24-, 36-, and 48-hour prognostication charts generated by Limited Fine Mesh computer model.

**B84-10412****COST CONSIDERATIONS IN NONLINEAR FINITE-ELEMENT COMPUTING**

S. UTKU (Duke University), R. J. MELOSH (Duke University), M. ISLAM (Duke University), and M. SALAMA (CALTECH)

Apr. 1985

**NPO-16237****Vol. 8, No. 4, P. 576**

Conference paper discusses computational requirements for finiteelement analysis using quasi-linear approach to nonlinear problems. Paper evaluates computational efficiency of different computer architectural types in terms of relative cost and computing time.

**B84-10413****SOURCE PRE-PROCESSOR OR INTERFACE-SPECIFICATION LANGUAGE**

W. J. LUEBKERT (Telos Computing, Inc.)

Apr. 1985

**NPO-15814****Vol. 8, No. 4, P. 576**

A user's guide available for source program pre-processor (SPP) method for producing descriptions of data structures or records. SPP enhances usefulness of Program Design Language (PDL) - software-design tool decreases debugging time and improves quality of source programs.

**B84-10414****LIBRARY INFORMATION-PROCESSING SYSTEM**

Innovator Not Given (Informatics General Corp.) Apr. 1985

**GSC-12861****Vol. 8, No. 4, P. 576**

System works with Library of Congress MARC II format. System composed of subsystems that provide wide range of library information processing capabilities. Format is American National standards Institute (ANSI) format for machine-readable bibliographic data. Adaptable to any medium-to-large library.

**B84-10415****ORBITAL AND GEODETIC ERROR ANALYSIS**

T. FELSENTREGER, P. MARESCA (Business Technological Systems), and R. ESTES (Business Technological Systems)

Apr. 1985

**GSC-12768****Vol. 8, No. 4, P. 577**

Results that previously required several runs determined in more computer-efficient manner. Multiple runs performed

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only once with GEODYN and stored on tape. ERODYN then performs matrix partitioning and linear algebra required for each individual error-analysis run.

**B84-10416**

### **MANAGING SOFTWARE DESIGN AND DESIGN CHANGES**

R. E. LOESH (CALTECH)

Apr. 1985

**NPO-15331**

**Vol. 8, No. 4, P. 577**

Microprocessor-based system for document production work scheduling, and change control and management information aids in design, development, and control of software. Main components Z80 microprocessor, floppydisk and hard-disk drives, and a character printer. System linked to large computer. Major software components are control program monitor (CP/M), text-editing and wordprocessing system, workbreakdown-schedule processor, and database management tool.

**B84-10417**

### **ERROR CORRECTION FOR TANDEM DATA-TRANSMISSION PATHS**

E. C. POSNER (CALTECH) and A. L. RUBIN (CALTECH)

Apr. 1985

**NPO-16125**

**Vol. 8, No. 4, P. 578**

Mathematical analysis for digital data transmission calculates optimum number of binary error-correcting repeaters to install in given number of wideband channel links. Asymptotic results compared to computed numerical results.

**B84-10418**

### **SIMPLIFIED CONVOLUTION CODES**

T. K. TRUONG (CALTECH) and I. S. REED (CALTECH)

Apr. 1985

**NPO-16251**

**Vol. 8, No. 4, P. 578**

Simple recursive algorithm efficiently calculates minimum-weight error vectors using Diophantine equations. Recursive algorithm uses general solution of polynomial linear Diophantine equation to determine minimum-weight error polynomial vector in equation in polynomial space.

**B84-10419**

### **PREDICTIVE SMOOTHING-CONVOLUTION ALGORITHM**

J. C. ALVAREZ (Ford Aerospace Communications Corp.)

Apr. 1985

**MSC-20604**

**Vol. 8, No. 4, P. 578**

Signal estimate continually updated with or without phase correction. Technique useful where signal varies slowly with respect to sampling rate.

**B84-10420**

### **PARALLEL VLSI ARCHITECTURE**

T. K. TRUONG (CALTECH), I. REED (University of Southern California), C. YEH (University of Southern California), and H. SHAO (University of California)

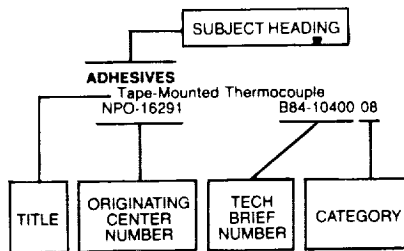
Apr. 1985

**NPO-16124**

**Vol. 8, No. 4, P. 578**

Fermat number transformation convolutes two digital data sequences. Very-large-scale integration (VLSI) applications, such as image and radar signal processing, X-ray reconstruction, and spectrum shaping, linear convolution of two digital data sequences of arbitrary lengths accomplished using Fermat number transform (ENT).

## Typical Subject Index Listing



The title of each Tech Brief is listed under several selected subject headings to provide the user with a variety of approaches in his search for specific information. The Tech Brief number, e.g., B84-10400, is located under and to the right of the title and is followed by a two-digit number, e.g., 08, which designates the subject category in which the entire entry can be found.

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**MICROPHONES**  
Microphone Detects Boiler-Tube  
Leaks  
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**MICROWAVE COUPLING**  
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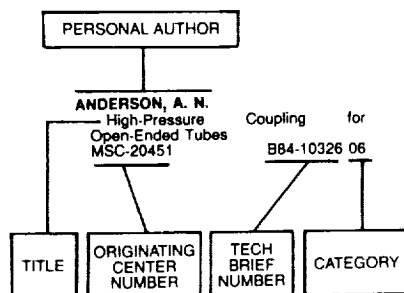
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**KALEJS, J. P.**  
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**KAN, K.**  
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**KATZ, J.**  
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**KELLY, T. R.**  
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- KLEINE, H.**  
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- KLEINT, R. E.**  
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- KNADLER, J.**  
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- LEE, J. J.**  
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- LEE, M. C.**  
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- LEIBOWITZ, L. D.**  
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- LIU, T. M.**  
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- LUPO, G.**  
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- MACKINNON, I.**  
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- MANCINI, R.**  
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- MANDEL, H.**  
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- MANGIALARDI, J. K.**  
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- MANN, W. A.**  
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- MARESCA, P.**  
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- MARGOLIS, J. S.**  
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- MARKE, M. L.**  
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- MARLOWE, P.**  
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- MARX, W.**  
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- MATHIPRAKASAM, B.**  
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- MCGARITY, J.**  
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- MITCHELL, R. T.**  
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- MOLINA, O. G.**  
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- MOLKO, P. M.**  
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- MON, G. R.**  
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- MOORE, D. M.**  
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- MOORE, E. B.**  
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- MORRISON, A. D.**  
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- MORRISON, A. D.**  
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- MORRISON, A. D.**  
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- MOSER, R. L.**  
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- MUKHERJEE, S. P.**  
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- MUSCARI, J. A.**  
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- NOLA, F.**  
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- ORTENDAHL, J. A.**  
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- OSTERWISCH, F. G.**  
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- PAGE, N. A.**  
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- PERKINS, G. S.**  
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- PHAM, H. Q.**  
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- POON, P. T.**  
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- PORTER, A. J.**  
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- PROUTY, T.**  
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**REED, I. S.**  
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**REILLY, H. F.**  
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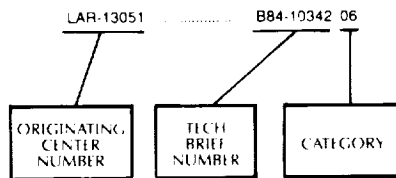


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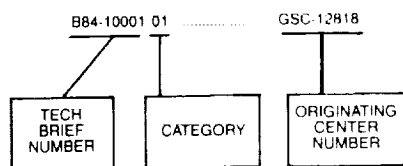


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